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HOME SCIENCE

A Text-book for Girls in High Schools and
Training Schools in South India

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THIS BOOK IS DEDICATED
TO
THE HOME-MAKERS OF INDIA
PRESENT AND FUTURE

‘ A home wants nothing when it has a good wife.
If such a woman is not found in the house,
Or if she is a woman that uses hard words
The house is like a den where a tiger dwells.’

Avvai (Translation from *Poems by Indian Women*).

‘ Wherever a true wife comes, home is always round her. The stars only may be over her head ; the glow-worm in the night-cold grass may be the only fire at her foot : but home is yet wherever she is ; and for a noble woman it stretches far round her, better than ceiled with cedar or painted with vermillion, shedding its quiet light far for those who else were homeless.’

JOHN RUSKIN
In Sesame and Lilies.

PREFACE

This text-book has been compiled from various sources and with the help of many obliging friends, in response to the immediate need for more material in simple form, for the study of Domestic Science. So many other sciences contribute to *Home Science* that any one text-book can cover only a fraction of the subject. This book attempts only four parts of the subject. The important branches of Hygiene, First Aid, Textiles and Clothing, Cookery, Home Furnishing and Decoration are not touched at all, and Sanitation is only partially dealt with. It is hoped that the subjects treated will be helpful. No one could feel more keenly than do the compilers, the inadequacy of any foreigner to deal with the topic of home-making for India. We trust that more and more Indian women will take up the serious study of Home Science and produce books adapted to Indian conditions. In the meanwhile this book attempts to bridge over the time when there is a great dearth of literature suited to the needs of Indian students.

Physicians and other scientists who chance to read these chapters, may find that large subjects are dealt with in a sketchy and somewhat vague manner. Realizing keenly that 'a little knowledge is a dangerous thing', we still feel that Indian women will not learn to trust and co-operate with the doctor until they understand something of the principles which explain the doctor's orders. In the west understanding and co-operation have followed knowledge of facts, and so they will anywhere. On the other hand, teachers who are accustomed to class Domestic Science with 'Moral Instruction' or 'General Knowledge' as worthy

of one period of good advice a week, may think the lessons too difficult. The book is on the same plane of difficulty as the Chemistry, Physiology, Botany and other studies which a girl has in Fifth and Sixth Forms. Unless she can form for this science the same respect which she has for the others, she is not likely to take it seriously. The book can be used for the two-year course required of all High School girls, or as aid to covering the subject-matter outlined in the syllabus for 'C' or Optional Domestic Science, newly issued. When translated into the vernacular, it is hoped that it may be used in Higher Elementary Training Schools in connection with the new syllabus. The lessons here included have all been taught to groups of High School girls, and some have been taught in Training School together with 'Rural Science'.

In the Nutrition section we have not attempted to introduce cooking-lessons, because foods vary so much in different parts of the Presidency. We leave it to the teacher to supplement each chapter of theory with practical work in the preparation of food, using the kitchen as her laboratory. Cookery is a subject which must be worked out by Indians themselves, whereas the general principles of Nutrition are the same the world over. Some suggestions for a cooking-syllabus are given in the new syllabus for 'B' Domestic Science in the Madras School Final course. Somewhat detailed directions are given here in the section on Invalid Diet, for the preparation of foods suitable to invalids and young children, for this is a field where Indians can learn much from the experience of western home-makers.

In the teaching of each section it is urged that the study be supplemented by practical work, so that each principle may actually function in the life of the pupil, and not end

with the printed page. Just as, in the Chemistry class, half the time each week is given to experimental work in the laboratory, so also in the study of Home Science should half the time be spent in the kitchen, the laboratory, the 'sick-room' or school-dispensary (an imitation one is better than none), the 'Baby Welcome' or the poultry-yard. Assignments to be carried out at home in the holidays will link up the Home Science class with the home. 'Learn by doing'.

It now remains to thank the many friends who gave freely of their time and their knowledge to help the enterprise.

We greatly appreciate the courtesy extended by Lieutenant-Colonel McCarrison, Director of Nutritional Research at the Pasteur Institute, Coonoor, who read the manuscript of the first section, and permitted us the extensive use of his charts, tables and pictures, giving the results of his researches. Macmillan and Co., the publishers of his valuable little book, '*Food*', kindly permitted us to reprint his tables of composition of foods, so that they might be easily available to the pupils using this book. In the preparation of the Nutrition section we are also indebted to Miss Joy Solomon, M.A., L.T., for the practical lessons on Rice, Oil and Jaggery, which she worked out with her own classes, at Sarah Tucker High School, Palamcottah.

For the Child Welfare section, part of the material was supplied by Miss Anna Degenring, M.D., the specialist in Children's Diseases at the Vellore hospitals and Medical School, and the rest by Mrs. A. R. W. Korteling, M.D., of the Women's Hospital at Madanapalle.

In the preparation of the third section we are much indebted to Miss Noordyk, R. N., Nursing Superintendent of the Scudder Memorial Hospital, Ranipettai, for her notes on Home Nursing (already used with several groups of High

School 'home-nurses') and to Dr. Korteling who read and corrected the entire manuscript of this section, as of the previous one.

The chapter on 'Supplementing the Family Income' in the Home Economics section was written by Mr. J. J. De-Valois of the Agricultural Institute, Katpadi, whereas the facts and figures for the budgets and accounts in that section were supplied by Indian friends.

Thanks are also due to Rev. M. A. deWolf of Chittoor for his photographs and sketches. Many others have helped by translation or advice to prepare the manuscript, and to these all we give our grateful *namaskarams*. Some credit should also go to our American forerunner, Willard and Gillett's *Dietetics for High Schools* for the idea of centering the study about a family.

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PART.I

Nutrition

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' Back of the loaf is the snowy flour,
And back of the flour the mill .
Back of the mill is the wheat, and the shower,
And the sun, and the Father's will.'

Babcock.

A worthy woman who can find ?
For her price is far above rubies.
The heart of her husband trusteth in her,
And he shall have no lack of gain.
She doeth him good and not evil all the days of her life.
She seeketh wool and flax and worketh willingly with her hands.
She riseth also while it is yet night,
And giveth food to her household.
She considereth a field and buyeth it ;
With the fruit of her hands she planteth a vineyard.
She layeth her hands to the distaff and her hands hold the spindle.
She stretcheth out her hands to the poor,
Yea she reacheth forth her hands to the needy.
Strength and dignity are her clothing
And she laugheth at the time to come.
She openeth her mouth with wisdom
And in her tongue is the law of kindness.
She looketh well to the ways of her household
And eateth not the bread of idleness.
Her children rise up and call her blessed ;
Her husband also, and he praiseth her saying,
Many daughters have done worthily but thou excellest them all.
Grace is deceitful and beauty is vain .
But a woman that feareth the Lord, she shall be praised.

The Bible (*Proverbs xxxi*)

CHAPTER I

FEEDING THE RANGANATHAN FAMILY

Mr. Ranganathan was a clerk who lived with his wife and five children on the main street of a fairly large town. Their oldest daughter, Padma, was married and lived in another town about fifty miles away. The eldest son, Narayanan, though only fifteen, was in the Fifth Form and very ambitious to get on into college and engineering college. Kamala, aged thirteen, was in the Third Form, which was the highest class of the local girls' school. She loved to study and was very anxious to go to boarding-school in the city the following year to finish her High School course. She even dreamed of college, but it was a matter of debate between Mr. and Mrs. Ranganathan and their relatives whether to let her go on, or stop her at home until she was married. She was very thin and had frequent attacks of fever, so that many thought she should not try to study further. Sundaresan, a fat little boy of twelve, seemed to have no ambition to study, and was only in First Form despite much nagging from his family. The little nine-year-old girl, Sita, was only a year behind him. Since two babies after Sita had died, the whole family was particularly devoted to the youngest, a baby-boy of fifteen months who was well named Rajan, for his parents and brothers and sisters were his devoted slaves. Mrs. Ranganathan, like many other mothers, found it a hard and perplexing task to feed this large family with only a small servant-girl in the kitchen to help her. Both she and her husband were constantly worried about money. His salary was only sixty rupees a month, and they could not seem to keep their

expenditures within that amount, moreover they had incurred heavy debts at the time of Padma's wedding a year before. The boys had tuition every afternoon, and Kamala had music-lessons both on the violin and harmonium, which were heavy but apparently necessary expenses. They all needed good food and that too was expensive.

Mr. Ranganathan's office and the children's schools opened at ten o'clock, and they had an hour's interval from one to two at noon. The boys were near enough to come home but the girls and their father were too far and had to carry a tiffin with them. Mrs. Ranganathan was up before dawn, like all good housewives, and had coffee ready for all of them to drink when they wanted it. There were generally *palagarams* or *appams* to eat with the coffee if they wished. In fact Mrs. Ranganathan spent a good share of every day sitting over the fire frying *pusthole* or *palagarams* or *vadais*, for the children were always demanding them. The rice and curry had to be ready by nine o'clock in the morning. Kamala helped her mother to prepare it while Sita carried the baby. Both Mrs. Ranganathan and Kamala were too hot and tired to eat very much themselves by the time they had fed the rest. Narayanan refused to leave his books until his mother insisted, and then ate very little. His mother tried to tempt his appetite with hot chutneys and different kinds of curries. Sundaresan, on the other hand, was her especial delight for he ate enormous quantities of anything she prepared, and was always ready for more. He was eating something nearly all the time he was in the house, as was little Sita. Sita only picked at her food, but was very fond of sweets and dried peas and puffed rice and other things to eat. She sat on her father's knee and coaxed him to give her a quarter-anna or an anna and then ran out to the bazaar to get *gelabi* or *murukku* or *omapodi* which she would share with no one but Baby

Rajan. She and Kamala rode a mile to their school in a bullock-cart after Kamala had drunk her coffee. Kamala really cared for nothing much but coffee in the morning or at any other time. She hated vegetables and would eat only certain kinds of very hot curry or chutney with her rice. Her mother filled a tiffin-carrier with rice and curds for her husband's tiffin, but the girls preferred *palagarams*, wrapped in a plantain leaf, and a large brass screw-top *cooja* of coffee.

When the boys returned at noon, Sundaresan ate more rice and curry and wanted plenty of ghee. Narayanan sometimes failed to appear if he stayed at the school to study, but in that case his mother sent him something to eat. She bought two ollocks of milk a day for Baby Rajan, but he was growing less and less inclined to drink it. Sometimes she struggled half an hour with him but he made such a fuss that she finally let him have some of her own coffee, or even put him to her breast to quiet him when he cried. Now that he could walk he was never still for a minute and either she or the servant-girl or one of the sisters had to carry or follow him all the time. He was thinner than he had been as a little baby and slept only in snatches at night, waking up frequently to cry. Unless someone walked about with him or swung him violently in the basket he would not go to sleep again. Sometimes he fell asleep on the floor in the day-time while he was playing. He was a very bright baby, delighting the family with his amusing tricks and attempts to talk. They loved to let him take up rice and curry just to see how cleverly he got it in his mouth, and to see him gasp when he got a hot chilli. The children were always feeding him pieces of their sweetmeats and *palagarams*. Both he and Sita had stomach-ache so often that their mother gave them a little castor-oil every day. The older children generally had castor-oil on alternate Saturdays or Sundays.

Soon after four o'clock on school-days, Mr. Ranganathan and the children returned from school. Kamala's music teacher kept her busy for an hour, after which she either helped her mother or prepared her lessons. Sita joined in music lesson as much as the restless baby would allow, but generally she had to carry him out into the street to amuse him. The boys' tutor came at five and kept them at work till nearly seven, after which the older one was too tired to do more than lie about. Sundaresan had a secret desire to play football with some of his friends on the *maidan* but they laughed at him because he was fat and short of breath, so he gradually got into the habit of wandering up and down the lanes instead, sometimes joining with others to play tricks on shop-keepers or on ignorant and stupid purchasers. At eight or sometimes more nearly nine, the family had their heaviest meal of the day, little Sita and the baby being awakened for their share. Narayanan and Sundaresan stayed up until ten or eleven by the light of a hurricane lamp. Sundaresan had one of his vomiting spells. He used to drink a little coffee every once in a while to keep himself awake. The rest of the family fell asleep. Mrs. Ranganathan was up several times in the night to soothe the crying baby.

CHAPTER II

THE CHILDREN HAVE A PHYSICAL EXAMINATION

Things were going on like this when, all in the same week, the children came home from school with letters from a doctor who had given them all a physical examination. Their mother did not understand why any doctor should interfere with her children without their father's permission. Wasn't it enough that they should be forever 'pricking' them with needles to avoid small-pox, plague or cholera? What was this new business of a doctor?



PHYSICAL EXAMINATION OF SCHOOL CHILDREN

Faulty conditions of teeth or tonsils, eyes or ears, heart or lungs, may hinder normal growth and development.

Her husband explained that this was also by rule of the *Sircar*, that every school-child should be examined in school hereafter. He opened the four slips of paper and stared at them a long time. They read something as follows :

R. NARAYANAN : Advise refraction. General debility. Lungs weak. Needs rest and good nourishment, and medical care.

R. SUNDARESAN : Twenty pounds over normal weight for his age and height. Must reduce weight. Under-nourished. Advise strict diet and regular exercise.

R. KAMALA : Anæmic and under-nourished. Ten pounds under-weight. Weak heart. Advise more complete examination, medical treatment and nourishing food.

R. SITA : Marked malnutrition. Advise tonsillectomy and examination for ankylostomiasis. Needs medical care and careful diet.

With a little help from the dictionary, Mr. Ranganathan understood part of these amazing statements.

‘The doctor says that none of them get enough to eat,’ he explained.

‘Enough to eat!’ exclaimed Mrs. Ranganathan, who had spent nearly eight hours that day in the smoky kitchen. This was adding insult to injury. She wept loudly and reviled the doctor.

‘What are “anky-los-to-mi-a-sis” and “tonsil-lect-o-my”?’ spelled out Sundaresan. ‘What did she say to you, Sita?’

‘We had a woman doctor,’ interrupted Kamala. ‘I was there when Sita was done and Sita’s teacher told the doctor that Sita was always sniffing and coughing. And when they put the thermometer in her mouth, she wouldn’t keep her mouth, shut.’

‘I couldn’t breathe!’ retorted Sita.

‘ And the doctor said she had flesh growing in her nose,’ Kamala finished.

‘ What’s refraction ? ’ demanded Narayanan. ‘ He made me read letters across the room, and listened to my chest a long time.’

They puzzled over the reports for some time. At last Mr. Ranganathan went for help to a woman-doctor, with whom they were acquainted. He returned to her office on the following Saturday with the four children, and waited till she examined them one after another, and took specimens for microscopic examination. She asked many, many questions about their food, their day’s programme, their previous illnesses, and other matters, and wrote down notes on a paper. Then she asked Mr. Ranganathan to come back with his wife three days later.

SOURCE BOOK

Richardson’s *Rebuilding the Child*—G. P. Putnam’s Sons—N. Y. and London. Pp. 13-53.

CHAPTER III

ADVICE FROM TWO FRIENDS

They were at the office at the appointed time. The Doctor-Friend brought with her a young woman, called Miss Arokiam, who had gone abroad for special training, whom she called 'the dietitian' of the hospital. First the doctor talked to them for a long time. What she said was something like this :

' It is true, as the school doctors have said, that all four of your children are under-nourished. Now don't feel hurt, Amma. I know how hard you work to cook for them, and I don't doubt that you give them plenty of food, perhaps too much food. The trouble is not that you do not feed them. The trouble is that you, like so many mothers in this town, do not understand how their bodies are made and what they need. Now your husband, I understand, is a clerk, and he has to use a typewriter. In order to make the typewriter do good work, he has to understand all its parts, and he has to know what oil to use and what to do to keep the machine in good condition. You see my motor-car outside there ? My driver has to know all about that to make it run well. We have to feed it with the right amount of petrol and the right amount of oil to make it work for us. If we poured in castor-oil, would it go ? No. Castor-oil is good for lamps and for medicine, but it is bad for motors. Our body is a machine. It works more than the motor for it works all the time. Even when we lie down to sleep at night, our hearts are beating and our lungs are breathing in air and our food is being digested. We must understand this machine and give

it just the right things to build it and repair it and make it work properly, otherwise something will go wrong.

‘Your children’s bodies are like machines, and you need to understand just what sort of food to give them to keep them well and to help them to grow. It is not that they need a large quantity of food. If you give them what their bodies need you can give them less, and you need not spend so much money or so much effort either. This friend here has studied all about food and she will help you to plan your meals to suit the needs of your family, if you wish. But first I want to tell you what I have found out about their present state of health. The hospital is the repair-shop for bodies that are out of order and the doctor can help to put matters right.

‘First the oldest boy, Narayanan. He has been developing his mind at the expense of his body. He has almost no exercise, and not enough sleep. He has injured his eyes by too much reading in dim light. He has not had enough fresh air to conquer the germs of coughs and colds and there is great danger that he will develop tuberculosis. My advice is that you stop him from school at once and make him rest for the remainder of the year. Let him forget his lessons, and give both his eyes and his mind a vacation. He must sleep on the verandah at night and rest there six hours a day, taking a short walk or working in the garden morning and evening. After three months let him come to me to see whether he needs glasses. I think that a change of food and a complete rest will accomplish more than glasses.’

‘But he cannot stop school!’ stammered the father. ‘I have paid his fees to the end of the term, and anyway he will lose a whole year. I need his help in supporting the family as soon as possible.’

‘If you keep on pushing him like this, you will not have a son very long’, replied the doctor sternly. ‘What good

will his education be to him if he loses his health? Let me finish my advice for I have a lot of patients waiting to see me.

‘The other boy, Sundaresan, is eating far too much food. He is over-working his organs. His body cannot take care of so much, so he loses the good of it. Moreover, he is being starved in certain elements which he needs. The dietitian will explain that. My advice for him is that you cut down his diet as she advises, and that you make him play football. Why isn’t he a Boy Scout? He is as fat and lazy as a jelly-fish. Make him lose ten or twenty pounds of weight and harden his muscles with exercise. Then you will see how he improves in his studies. An afternoon of football will do more than a dozen tutors if his brain is not befogged with over-eating.

‘Then the girl, Kamala. Her heart is weak but that is something which she will outgrow. She is growing fast and she is working her body too hard with too little nourishment. She might just as well try to run a motor without petrol. She must get ten hours of sleep at night, outdoor exercise and plenty of milk and nourishing food. And she must absolutely stop drinking coffee. It is doing her harm.’

‘But she won’t drink milk,’ interrupted Mrs. Ranganathan. ‘None of my children will drink milk, no matter what I say.’

‘Miss Arokiam, the dietitian, will advise you about that. Another trouble with Kamala is that her blood is full of malaria-parasites, and the result is that she is very anæmic. See! Her blood should be bright red like this . . .’ She showed them a chart, ‘and instead it is pale like this. We must kill the malaria germs which give her fever and then help her body to build good red blood. She had low fever when I examined her, and doubtless has it now. Please leave her here in the hospital for a week so that I can give her the treatment she needs.’

And the little girl?' asked Mr. Ranganathan apprehensively, remembering the long, long words on the report.

'She had better come along to the hospital with her sister. Until one or two repairs are made, she cannot get the good out of any food she eats. There are thousands of hookworms in her intestines sucking her blood and draining the life from her. That is what is meant by ankylostomiasis. One or two doses of medicine ought to put that right. Then the poor child is being starved for air because her nose is blocked with adenoid growths, and her throat is blocked by tonsils. The tonsils would do no harm if they were not enlarged so that they hinder her breathing. They also have pus-pockets in them which will poison her body if they are left. Does she sleep well at night?'

'Oh no', replied the mother. 'She keeps me awake by snoring, and often gets up and walks around in the night. She always has colds and coughs.'

'Let me take out the tonsils and adenoids and she will feel much better. And now I will leave you to Miss Arokiam, for I must go. If you decide to follow my advice, I will expect Kamala and Sita to come in as in-patients to-morrow.'

The Doctor-Friend hurried away to the dispensary. Mr. and Mrs. Ranganathan looked at each other in some bewilderment. It was not as bad as they had feared, but it was bad enough.

Mrs. Ranganathan turned to Miss Arokiam.

'Tell me, what does the doctor mean when she says that our children do not get enough food? My husband gets a salary of only sixty rupees. I think we spend more than half of it in food. I give them plenty. It is true, they won't always eat, but is that my fault? If they were hungry that would show that they needed more, but they always say they

are not hungry. Three she blames for not eating enough and the fourth, who eats properly, she says must be starved.'

'You see those men building a house out there,' explained Miss Arokiam, pointing through the window to where they were building a new wing of the hospital. 'They need bricks chunam, stones, sand and later doors, windows, furniture. When the people live in the house they must have firewood for the hearth and oil for the lamps. So many, many different things are needed for a house. In the same way our body needs many different kinds of foods. Some are for building the bones and muscles and organs, some for fuel to give heat and energy. Now suppose the coolies brought nothing but bandy-loads and bandy-loads of firewood? That would be more than was needed for fuel. It would simply fill up the storeroom and lie about the compound hindering the builders. The builders would have to stop work and say, 'Bring us more chunam! Bring us more tiles! We cannot build.' Or suppose all the materials were there, and there were no carpenters or masons to put them together? It is only when all the builders are there and the right materials, that the house can be built and furnished and used.'

We cannot report the whole conversation between Miss Arokiam and the Ranganathans. Suffice it to say that they became very much interested in what she had to tell them and wanted to learn more. Mr. Ranganathan borrowed an English book on Dietetics, and his wife promised to attend a Mothers' Club to be held every Friday afternoon at Kamala's school, where Miss Arokiam was to begin a course of lectures on Food. When they went home and told the children of their interviews there was much consternation and rebellion, but Mr. Ranganathan was firm.

'I don't have to go to the hospital for a week to learn all that', protested Kamala, weeping. 'We are beginning to

learn Dietetics in Domestic Science. I don't care what the books say—I won't drink milk! '

Nevertheless, the doctor's advice was put into effect. Narayanan lay on the inner verandah instead of going to school. Kamala and Sita went off to the hospital, where their one week lengthened into two. Sundaresan joined the Boy Scouts at his father's stern command, but when his mother refused him *palagarams* he got money from his father on false pretences and bought them secretly in the bazaar. After Mrs. Ranganathan began to attend the Mothers' Club, and Kamala returned to her Domestic Science classes, there was a great deal of talk in the family about this new science. The following chapters will give you a summary of what Kamala and her mother learned about Nutrition. You will find it interesting to study with them.

CHAPTER IV

PROTEINS

1. Composition

The proteins in different foodstuffs all differ from one another to some degree, but they all contain the following elements: carbon, hydrogen, nitrogen, oxygen and sulphur. In the stomach and intestines proteins are acted upon by various digestive juices (enzymes) and changed into simple acids called *amino-acids* which are absorbed into the blood and carried to the tissues.

2. Function

Protein has two important uses :

- a. It builds the muscles and glands of the body.

What work do our muscles do ?

What important glands of our body can you mention ?

Could we live without muscles and glands ?

At what time of our lives does the building-process go on ?

It appears, therefore, that the most important time of our lives for eating proteins is in babyhood, childhood and youth while our bodies are being formed. In old age we do not need such a large quantity. At all times, however, we need protein to fulfil its second important function.

- b. It repairs the worn-out muscles and glands.

What work do your arm-muscles do ?

What work do your heart-muscles do ?

What work do your kidneys and liver do ?

What happens to a bicycle when you use it everyday for a long time ?

What happens to the tyres of a motor car ?

We send the bicycle and the motor-car to the repair-shop to have their tyres and other parts renewed, but our body repairs itself. While we are resting from activity or sleeping at night, the protein rebuilds and renews the worn-out cells of our muscles and glands, without any trouble to us.

3. Kinds of Protein

In general there are two kinds of proteins—animal-proteins and vegetable-proteins.

a. Animal Proteins include the proteins found in fish, milk, milk-products, and the muscles and glands of animals. These exist in the following quantities :

FOOD		PROTEIN	FOOD		PROTEIN
Chicken meat	...	20 per cent	Egg	...	13 per cent
Chicken heart	...	21 „	Milk	...	3 „
Chicken liver	...	22 „			
Chicken gizzard	...	25 „			
Mutton	...	18 „			
Liver	...	20 „			

b. Vegetable Proteins. The leguminous plants have the ability to take nitrogen from the air and store it, forming protein. Leguminous plants include the plants of the pea-family,—beans, peas, *dals* and grams, also ground-nuts.

Grains and other seeds also include a small percentage of protein.

Following is a list showing the proteins contained in the different legumes and seeds :

FOOD	PROTEIN	FOOD	PROTEIN
Soy beans ...	38 per cent	Mustard ...	18 per cent
Ground-nuts ...	29 "	Cocoa bean ...	21 "
<i>Dal</i> ...	25 "	Wheat ...	11 "
String-beans ...	26 "	Thenai ...	11 "
Peas ...	24 "	Ragi ...	10 "
Bengal gram ...	17 "	Kambu ...	10 "
Black gram ...	18 "	Varagu ...	10 "
		Cholam ...	9 "
		Maize ...	7 "
		Rice ...	6 "

4. The Daily Requirement of Protein

Little babies, who are growing very fast, need one and a half grammes of protein for each pound of body weight, whereas adults, whose growth has stopped, need half a gramme daily, for each pound of body weight. Growing children need to have an amount somewhere between these two extremes.

Considering your age and weight, how many grammes of protein do you think you need in a day?

It is of no use to eat more than the necessary amount of protein. Any extra protein is burned by the body as a fuel food. Protein foods are too expensive to use for fuel. When we want to build a fire we do not take the doors and windows of our house for firewood. We burn cheap wood for fuel, but use more expensive wood for building the parts of our house. In the same way, we should use the cheaper carbohydrate food for fuel and eat only the amount of protein required for building our muscles and glands and keeping them in repair.

At the same time, it is very necessary that we get enough

protein every day to supply the needs of the body. No other food-element can supply the lack, if we eat too little protein. Children who have too little protein do not have normal growth of either body or mind. It is imperative that you find out whether you and the members of your family are getting the protein you need.

5. How to find out whether you get enough protein in a day

Measure out the amount of rice, dal, beans, meat and other protein foods (uncooked) that you eat in a day. Weigh each separately in a chemical balance to find the total number of grammes of each. For example, you may find that an ollock of rice weighs 185 grammes. From the above table you know that 6 per cent of the total quantity of rice will be protein grammes so you know that an ollock of rice will give you 6 per cent of 185 grammes or 11.1 grammes. As you proceed, fill out a table like the following.

HOW MANY PROTEIN GRAMMES I EAT IN A DAY

MORNING MEAL		NOON MEAL		NIGHT MEAL	
	Prot. Grams		Prot. Grams		Prot. Grams
$\frac{1}{2}$ Ol. ragi, or wheat	_____	$1\frac{1}{4}$ Ol. rice.	_____	1 Ol. rice.	_____
1 Chittack milk	_____	1 Chit. dal.	_____	Mutton.	_____
$\frac{1}{2}$ Chit. Jag-gery	_____	3 Brinjals.	_____	$\frac{1}{2}$ Chit. dal.	_____
Total	_____	Total	_____	Total	_____

My requirement of Protein Grammes for a day is Grammes.
 Total number of Protein Grammes I eat in a day is Grammes.
 Balance _____

When you fill out the above table you will know whether you are eating enough protein food to build your muscles and glands. Remember that growing boys and girls need more protein food than adults. If you are not getting enough, plan how you can add more protein to your daily diet.

6. Vegetarian Diet

Many people in India consider it a sin to eat meat, and many others do not like meat even though they see no harm in it. Some say that eating meat makes people fierce and warlike, but when we study the races of mankind we see that this is not so. The Eskimos of the North are a gentle, happy people, although they live on meat entirely.

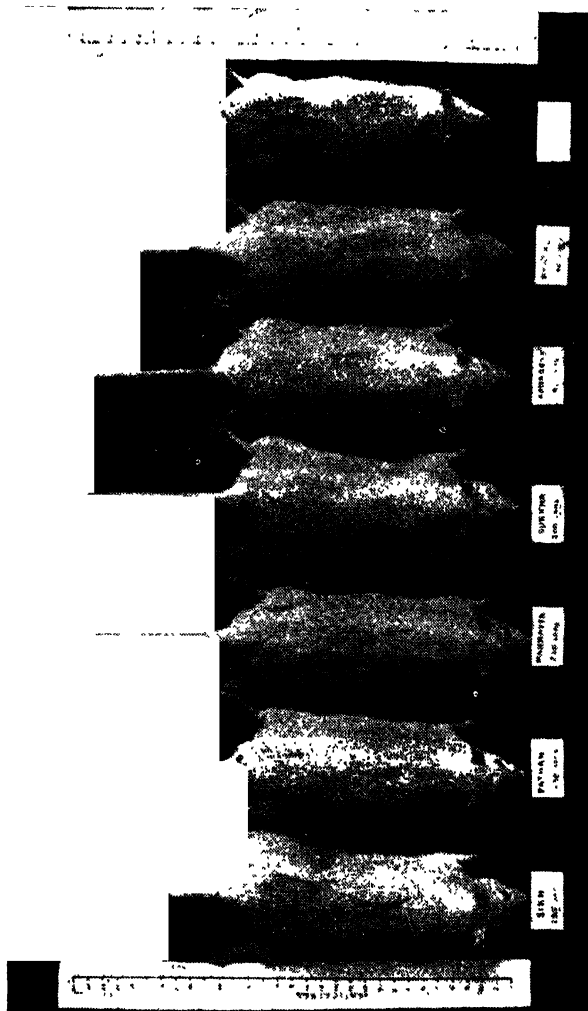
Those who do not include meat, fish or eggs in their diet lose a large amount of protein which they should make up in other ways. They should be careful to eat enough of the legumes and grains to provide them with the protein needed to build their bodies. Scientists have proved by experimentation that animal proteins contain more nitrogen and are more essential to growth than vegetable proteins. There are also certain mineral elements lacking in the legumes and grains. The bones, muscles and glands will not develop as they should in a person who lives on a diet of grains and legumes only. Vegetarians must take a great deal of milk, curds and ghee to supply animal proteins, and green, leafy vegetables to supply the missing mineral elements. If they are careful to do this, they can get on without meat or fish.

PROBLEM: *Plan a week's vegetarian diet for yourself.*

7. The Diet of Different Races in India

Dr. McCay and Dr. McCarrison, scientists who have studied the different races of India and their various diets, tell us some interesting facts about the effect of diet upon the strength and health of all races. Study the table of diets. (See Appendix.)

The strongest people in India are to be found among certain Himalayan hill-tribes and the fighting-races of India,—Pathans, Sikhs, Panjabis, Dogras, Rajputs and North Indian

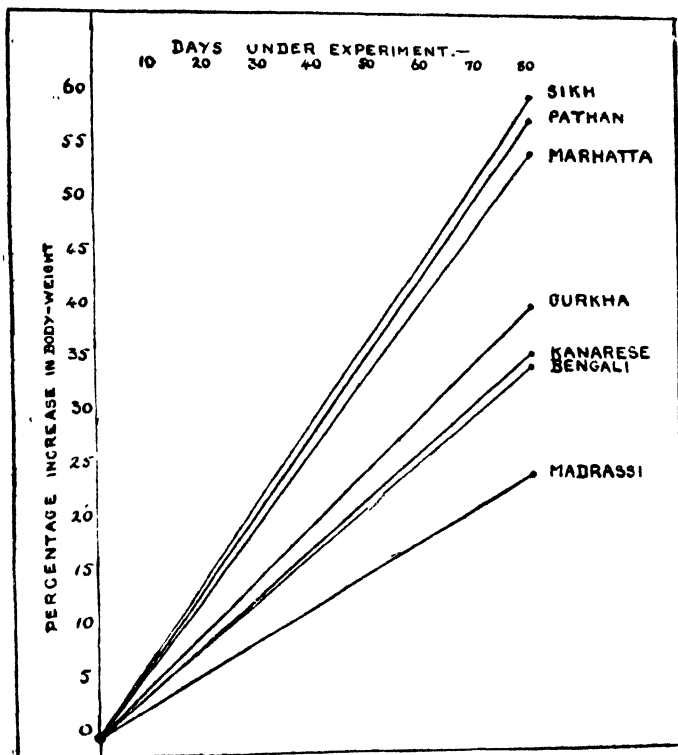


EXPERIMENT TO PROVE EFFECT OF DIET ON RACES

(By Courtesy of Dr. McCarrison)

These white rats were fed on the diets of the various races of India. Their weights at the close of the experiment are here listed. Note that the rat fed on Madrassi diet is the smallest.

Brahmins. These men and women are tall, strong and active. They rarely suffer from intestinal diseases. Many of them go as soldiers and policemen to other parts of the British Empire. Compared with these races, the people of lower Bengal and the Madras Presidency are small and poorly developed. They suffer a great deal from intestinal diseases such as diarrhoea and dysentery.



GRAPH TO SHOW GROWTH IN WRIGHT OF RATS DURING THE EXPERIMENT IN FEEDING ON DIET OF DIFFERENT RACES

(By Courtesy of L. v. McCarrison)

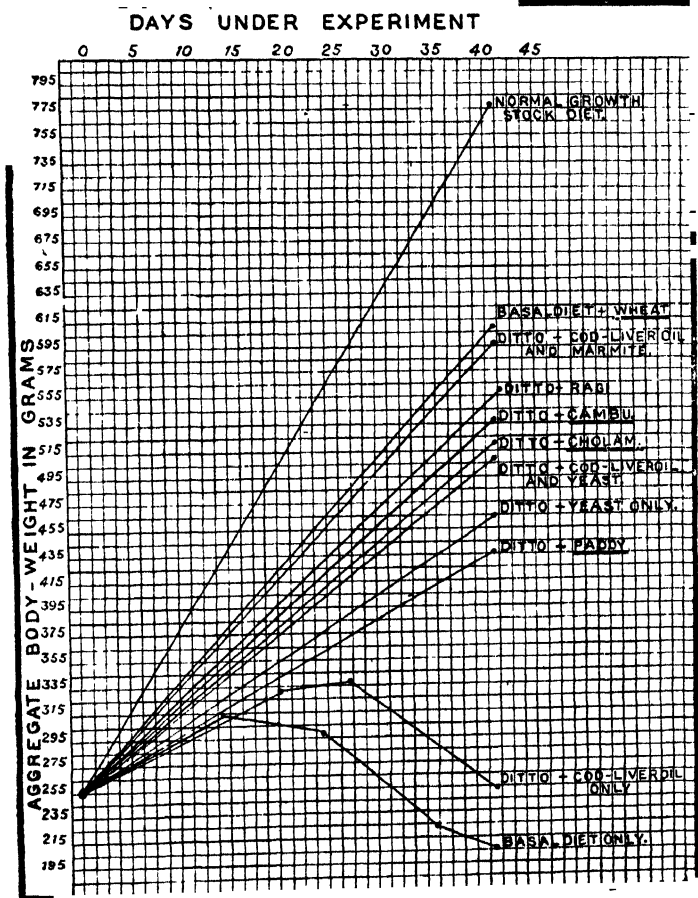
What makes the difference ?

The Sikhs eat whole-wheat *chapatties*, legumes and tubers, green vegetables and ghee, and occasionally meat. They drink large quantities of cows', goats', and buffaloes' milk from babyhood up. The Pathans eat more of meat and less of legumes than the Sikhs, also more fruit and nuts. The people of Hunza in the Himalayas 'are unsurpassed by any Indian race in perfection of physique; they are long-lived, vigorous in youth and age, capable of great endurance and enjoy a remarkable freedom from disease in general'. The diet of these people consists of less meat and less milk than the Pathans and Sikhs, but a greater quantity of fruit. Their chief article of food is a kind of cake made of dried mulberries mixed with whole-wheat flour.

When we turn to the physically inferior people of Bengal and Madras, we find that their diet consists largely of rice and legumes. This is a diet that provides too much starch and too little protein and certain vitamins and minerals for proper growth. Some may contend that the Pathans and Himalayan tribes have a colder, more invigorating climate than the people of the South. This is true, but we find a marked difference between the rice and legume-eaters of Bengal and the wheat and legume-eaters of the United Provinces where the climate is the same.

By such observations as these, as well as by careful experiments upon animals, the scientists have proved beyond a doubt :

- (1) the superiority of wheat to rice as a main article of diet ;
- (2) the superiority of animal proteins to vegetable proteins ;
- (3) the importance of vitamins and mineral-elements (to be studied later).



GRAPH OF ANOTHER EXPERIMENT IN FEEDING RATS ON
DIFFERENT GRAINS

(By Courtesy of Dr. McCarrison)

QUESTIONS

1. Make a list of animal proteins and the vegetable proteins in the diet of the Sikhs and Pathans. Compare them with the proteins of your own diet.
2. What changes should the people of the Madras Presidency make in their diet, in order to become strong and healthy like the Northern races?
3. What other grains beside wheat, contain more protein than rice?
4. How can you change the diet of your school or of your home to increase the amount of protein?
5. Why do people recovering from long illnesses need to eat eggs and drink milk?
6. Make a list of the proteins which the Rangarathan family ate. Did any of them get enough of this element?

SOURCE BOOKS USED IN COMPILING THE MATERIAL FOR THIS CHAPTER

- The Newer Knowledge of Nutrition* by E. V. McCollum, Chapters iv, v, vi, vii.
- Articles by McCarrison in the *Indian Medical Journal*.
- McNally's *Sanitary Handbook for India*. Chapter and tables on Diet.

CHAPTER V

MINERALS OR ASH-CONSTITUENTS

Look at the table (see Appendix) showing the elements which make up our bodies. How many minerals are in the list? Have you seen or handled any of these minerals? What do you know about any of them, or any of the compounds formed from them?

If an animal body is burned, or if any food-stuff is burned, these minerals will be left in the ashes. Their form may be changed but they will not be consumed. For this reason the mineral elements are sometimes called 'ash-constituents'.

Function of Minerals in General

There are three ways in which the ash-constituents take part in the functions of the body :

1. They give hardness and rigidity to our bones and teeth.
2. They form an important part of the soft tissues (muscles, blood-cells, etc.).
3. They are found in solution, in the various *fluids* of the body, where they affect the muscles and nerves and also the digestive juices and other secretions of the body.

In order to understand their functions in detail we should need to study a great deal of Organic Chemistry, but the above outline serves to show us how important the mineral elements of our body are as *body-building materials*, as well as in other ways. We shall now take up, one by one, a few of the important minerals.

(A) Calcium

1. FUNCTION: One form of calcium with which we are familiar is common chalk. Another is lime or *chunam* which is used in building houses, also the *chunam* that is chewed along with *pan-supari*. Another form of calcium forms an important constituent of our bodies. 99 per cent of it is in the bone and teeth while 1 per cent is a very important part of the soft tissues and the body-fluids, such as blood. The calcium salts in the blood are absolutely necessary to the beating of the heart. From what you know of the properties of calcium, what would you think would be the function of the calcium in the bones and teeth?

2. SOURCES: Flesh-eating animals get their calcium-supply by gnawing the bones of other animals. For us the chief source is milk. At what period of our lives do we drink the most milk? Why? Other foods which give us less quantities of calcium are beans, butter-milk, *dal*, wheat, egg-yolk, cocoa, onions, cauliflowers, greens, radishes, brinjals, oranges, figs, potatoes, tomatoes, and some other vegetables. Another source for a small amount of calcium is water, especially if the water be 'hard'.

3. REQUIREMENT: An adult needs 0.0045 gramme of calcium per day for each pound of body-weight. From the table (see Appendix VI) you can work out what foods will bring you this quantity. Mothers and babies and growing children need even more.

Since calcium is an important body-builder, it is necessary for the baby. Both before and after the birth of her child the mother needs to eat foods which contain calcium. If she does not get enough of a supply for her own and her baby's needs, her own bones and teeth may be weakened by having the calcium withdrawn for the urgent needs of the baby's body, or her child may go through life suffering from poor teeth, or

deformed because of bones that are too easily bent, because there was not enough calcium to build them strongly. Both during pregnancy and the time when she is giving milk, the mother must plan her diet to include plenty of milk and other foods rich in calcium. After birth the baby lives on milk for nearly a year. When weaned also, the child needs a great deal of calcium all through the period of growth.

(B) Phosphorus

1. **FUNCTION:** Phosphorus is another important body-builder, for it is not only part of the bones and teeth, but it is a part of the nucleus of every cell in the body. It affects both the digestive and nervous systems, and is necessary to growth.

2. **SOURCES:** The foods which give us phosphorus are milk, butter-milk, fish, cocoa, eggs, greens, pumpkin, lettuce, celery, cauliflower, cucumbers, green peppers, beans, *dal*, brinjals, peas, tomatoes, corn, carrots. Other vegetables, as cabbage, potatoes, and radishes,—fruits, as oranges, prunes, plantains,—and nuts, as cocoanuts, ground-nuts, almonds—as well as all the common grains, contain a smaller quantity.

3. **REQUIREMENT:** An adult needs 0.01 gramme of phosphorus per pound of body-weight. From the table (see Appendix VI) make a list of what foods you should eat in a day to satisfy this requirement.

Many cases of malnutrition are said to be due to a lack of sufficient phosphorus. When we compare the functions of phosphorus and calcium we shall see that phosphorus is as important as calcium for the expectant and nursing mother, and for growing children.

(C) Iron

1. **FUNCTION:** Although there is such a small quantity of iron in the body, it is very necessary that we eat enough food

containing iron each day to maintain that amount. Iron-starvation results in a condition known as *anæmia*. Iron forms a part of the red blood-corpuscles which, as you have learned in Physiology, carry the oxygen from our lungs to every living cell. There the oxygen unites with glucose and other digested food-substances in a process called *oxidation*, which is in reality a burning up of the fuel foods to set free heat and energy. By means of this process of oxidation, the body is kept at the normal temperature necessary to life, and the organs receive energy to work. Iron plays an important part in this process and has, therefore, been called 'the key that unlocks the energy from the food that we eat'.

Iron has also a part in other important processes such as secretion, reproduction and development. The iron to be found in the germ and in the outer layer of grains gives evidence of its value in the growth and nutrition of young plants as well as animals.

2. SOURCES: We find iron in the yolk of egg, and in many vegetables and fruits such as spinach or greens, lettuce, cabbage, celery, beans, *dal*, radishes, cauliflower, lemons, raisins, brinjals, tomatoes, carrots, cucumbers, onions, pumpkins, prunes, figs, watermelons. There is a less quantity in corn, sweet potatoes, plantains, oranges, grapes—also in mutton, fish, milk, cocoa, cocoanut, honey, macaroni. As has been mentioned above, most grains such as rice and wheat, contain iron in their germ and in their outer layers, but if these parts are polished off we do not get the benefit of the iron or other minerals.

3. REQUIREMENT: Adults require 0.0001 gramme or more of iron for every pound of body-weight. As is the case with other minerals, expectant and nursing mothers need a larger amount than other adults and growing children need most of all. Before birth a reserve store of iron is laid up in the body

of the infant. If the baby gets its mother's milk, this store of iron is sufficient for a year, but if it is fed with diluted cow's milk, the store is used up more quickly and the feedings need to be supplemented by some other source of iron which the baby can easily digest, as diluted orange-juice or tomato-juice.

Anæmic people are sometimes given iron- tonic by the doctor, but as a prevention of anæmia it has been found that the iron in fruit and vegetables and other foods is more beneficial to the body than medicinal iron.

It is necessary, therefore, that we plan our diet to include foods rich in iron, rather than run the risk of starving our blood. Large quantities of food will not nourish our bodies unless we have good, red blood.

(D) **Sodium Chloride, or Common Salt**

This is a compound of two elements, sodium and chlorine.

1. **FUNCTION:** This salt, like other mineral salts, is needed in the blood and in the tissues where it influences the work of those tissues in absorption and other processes.

2. **SOURCES:** We get a certain amount of sodium chloride by eating meat, but also add it as a condiment to our food.

3. **REQUIREMENT:** Common salt is the only mineral for which we feel a craving that is not satisfied by the amount present in foods. We need it particularly in connection with foods rich in *potassium*, as potatoes and green vegetables. There is, however, danger of our eating too much rather than too little salt. Large quantities may over-stimulate the digestive tract and interfere with the digestion.

(E) **Other Minerals**

SULPHUR is absorbed by plants from the soil and used in the formation of proteins.

POTASSIUM helps to form the protoplasm of cells, the corpuscles of the blood, and milk. We get the necessary supply from milk, fruit and green vegetables.

MANGANESE: Scientists are now finding out the importance of the small amount of manganese that is in our bodies, as necessary to growth. Wheat is an important source of manganese.

(F) **How Plants and Animals feed each other**

The work of the body is carried on under the influence of the various elements. Every day a certain amount of each element is used up and excreted through the kidneys and intestines. For this reason we must keep on eating every day the foods containing the necessary elements.

The mineral elements which are excreted, enrich the soil by supplying food for plants. The plants, in turn, absorb these elements and, with the help of sunlight and water, form them into new foods for animals and men. In this marvellous way God has planned that the plant and animal world shall feed each other without loss.

ASSIGNMENTS

1. Using the material given you in this chapter, prepare in your notebook a tabular outline of the functions, sources and requirement of Calcium, Phosphorus and Iron, which will help you to keep the facts clearly in mind.
2. Using the tables (see Appendix) plan a week's diet for the Ranganathan family, which shall include sufficient mineral elements.
3. Make a pictorial diagram to show graphically how plants and animals feed each other.
4. Plan a kitchen-garden for your home, where you can grow the most necessary fruits and vegetables. Try to carry out your plan.

QUESTIONS

1. Why do dogs like to gnaw bones ?
2. Poultry-raisers tell us that we can increase the number of eggs laid by our hens if we grind up bones for them to eat. Why ?

3. Why is it that we cannot grow crops or flowers in our fields or gardens without manuring the soil frequently? What different fertilizers do farmers use in their fields?
4. Why is it that anæmic people continue to be thin and pale, no matter how much food they eat?
5. Why are good, strong teeth essential to health?
6. A lecturer on the importance of good posture made the following statement: 'A person's physical training begins nine months before he is born.' What do you think was meant by this?
7. It is a common idea in India that expectant and nursing mothers must not eat certain fruits and vegetables such as oranges and pumpkins. In the light of what you have learned in this chapter what advice would you give in this matter?
8. Why should mothers and growing children drink milk and eat vegetables?

SOURCE BOOKS USED IN COMPILING THE MATERIAL FOR THIS CHAPTER

- Chemistry of Food and Nutrition*, by Henry Sherman, Chapters IX, X and XI. Second Edition.
Article on Manganese, by McCarrison.
Dietetic for High Schools, by Willard and Gillet, pp. 59-70

CHAPTER VI

CARBOHYDRATES

1. Composition

Because sugar, starch and cellulose have somewhat the same composition they are grouped into one class, carbohydrates.

Carbohydrates furnish carbon, oxygen and hydrogen. All carbohydrates to be used in the body must be changed to simple sugars. The digestion of starches and sugars begins in the mouth, where they are changed to simple sugars called dextrin and maltose. In the stomach there are no enzymes acting on carbohydrates, but the digestion may continue under the influence of swallowed saliva for a time. In the pancreatic juice there is another substance which completes the splitting of starch to maltose and then the intestinal maltose (simple sugar) can reduce this to glucose which will be absorbed into the blood stream. Cellulose (woody fibre) cannot be digested and simply serves as bulk to diet.

2. Function

Carbohydrates are known as the energy-giving or fuel foods and they supply energy in the most economical form.

What do we mean by fuel? Have you ever heard the human body called an engine?

Just as you need fuel to make an engine go—as for example petrol in a motor car or coal in a steam engine—so you need fuel to burn in the body. Even when one lies perfectly quiet and appears to be resting, the body is working. Wherever an attempt is made to make an engine work,

some of the energy will be changed to heat. So in our bodies the fuel foods enable us to work and furnish heat at the same time.

3. Kinds of Carbohydrates

The chief carbohydrates taken as food are sugar,—cane-sugar, milk sugar, maltose, glucose and starch.

Kinds : Sugars : granulated, powdered, lump sugar, brown sugar and jaggery, honey, syrup (glucose). Glucose is used in the manufacture of sweets and is not as sweet as ordinary sugar. Fruit sugar is much sweeter than glucose. Plantains and dried fruits are rich in sugar. You may use another sugar,—milk-sugar (lactose). It is obtained by crystallizing it from the whey of milk. It is not sweet but it is used often in mixing milk for feeding the baby.

Testing for Sugar

To make the sugar test, boil together a weak solution of copper sulphate with some sodium or potassium hydroxide.

1. Try the chemicals by putting one teaspoon of the copper sulphate solution in a test tube or clean dish and add the hydroxide solution until the precipitate that forms at first, dissolves. Then boil the mixture together and notice the colour that is produced.

2. Next put into another test-tube or dish a drop or two of syrup or some water in which you have cooked two raisins. Add the two chemicals as you did before, then boil the mixture and see how different a colour is given when sugar is present.

3. This colour is given by glucose, fruit sugar and milk sugar, but not by pure cane-sugar.

Dissolve a little granulated sugar in water, add the chemicals and boil as before.

4. Next, dissolve a very little granulated sugar in water and add a few drops of lime juice or strong vinegar and boil together for five minutes. Then add the chemicals, but be sure that you add enough of the hydroxide so that the mixture is blue, not green. Then boil it. What has the acid done to the cane-sugar ?

Do we need to eat manufactured sugar ? You eat sugar in fruits and in most vegetables as well as obtain sugar from digested starch. It is probable that you do not need to eat

sugar—but almost every one enjoys eating sugar. What are the dangers in eating too much sugar?

1. It is a good fuel food but does not contain vitamins or mineral salts. If you eat so much sugar that you do not eat enough of other foods to secure the right amount of these necessary elements, what will be the result?

2. Eating too much sugar may cause it to ferment in the stomach.

3. Sugar in concentrated form is irritating. Try keeping a piece of hard sweet against the side of your cheeks without removing it for some time and what is the result? The sugar you eat with other foods is less concentrated. So the best time to eat sweets is at the end of a meal.

Questions for Review

1. What happens to starch in digestion?
2. What two sugars are found in most fruits and honey?
How can we make them from ordinary sugar?
3. How many sweets do you think you should eat? Why?
When is the safest time to eat them? Why?
If you have eaten many sweets, why will it help to drink water?
4. What are the dangers in eating too much sugar?

Starch

Starch is found in all plants, particularly in the seeds of cereals and pulses, and in potatoes and in other tubers.

If a substance contains starch, it changes to a blue colour when a drop of Tincture of Iodine is added to it.

Starch test

1. Test various substances for starch, as flour, rice, wheat, sago, potato, meat and eggs.

2. Mix $\frac{1}{2}$ teaspoonful of corn starch with cold water in a test-tube. How is a solid substance changed when dissolved? Is starch soluble in cold water? What important difference between starch and sugar does this experiment show?

3. The effect of heat on starch:

a. Heat the above mixture—what change was caused by heating? Let it stand for a few minutes. Have the starch and water separated as in the uncooked starch?

b. Drop a teaspoon of dry starch into boiling water.

Cereals

The most important are rice, wheat, ragi, millet, barley and corn.

RICE

Roughly rice is divided into two kinds—namely, white rice and red rice or big rice and small rice. There are about sixty different kinds of rice. Some of them are:

Seeraka (cummin) samba	Sembalai
S'rumari samba	Poombalai
Sanna (fine) samba	Muttai (egg) kar
Oosi (needle) samba	Kadappu kar
Illupai-pco samba	Mosanam
Mallikai (jasmine) samba	Manakatthai
Kodai (summer) samba	Pitchavari
Irku samba	Isarkovai
Punuku samba	Irakku mettan
Kamban samba	Sornavari
Kaivala samba	Avasara samba
Kunguma samba	Pulluthu Viratti
Kur dai samba	Paraimara (palmyra) samba
Mutthu (pearl) samba	Seengunni
Moran samba	Elephant-tusk
Malan samba	Arikiravi
Seevan samba	Mei-kuruvi
Sembla priyan	Bridegroom samba
Pisanam	Aruvathanguruvai
Malai Kuluki	Manvari
Madu Villungi.	Thattavellai
Kadai Kaluthan	Kalmanvari

Among the above-mentioned kinds of rice the *sambas* are the best. When it is cooked it is tasty. When you wash it it feels soft, and it has a good odour. Elephant-tusk is eaten by well-to-do people. As it is easily digested, it is also eaten by those who have weak digestion.

Good Paddy

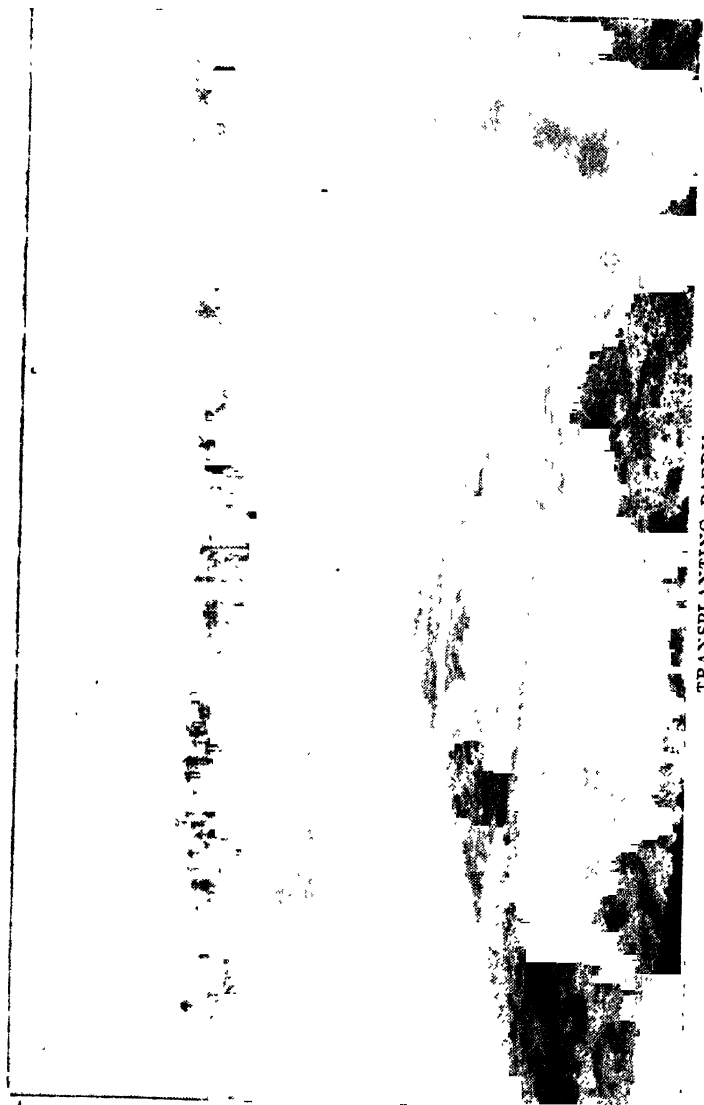
Good paddy is heavy and golden-coloured. When crushed between the palms it looks fully developed.

Cultivation of Paddy

Seeds are taken from the previous year's harvest and preserved. They must be well dried. They are put in a sack and soaked in water for twenty-four hours, from one evening to the next. The second night the sack is taken out of water and either put in a dark closed room or buried in the rubbish-pit until the seeds sprout and are ready for sowing. The soil is already prepared well. If it is wet land with plenty of water around, cattle are hired to graze there for some time to fertilize the soil. Soon after even a light shower the land is ploughed two or three times and the surface is levelled. The sprouting seeds are taken to the field and sown. There must be plenty of water in the field for a few days. The plants grow to a height of half a cubit within thirty or forty days. At this stage there should not be much water in the field or the plants will die. On the other hand the field must not be dry for that will affect the yield of the crop.

The plants are then transplanted and the field is irrigated on alternate days. In the third month ears of paddy appear and ripen in another three months. If the plants are stunted in their growth more manure is used—chiefly ground-nut cakes, mixed with the soil. If the plants grow very tall the tops are cut off. The grains are green in colour and contain a milky substance which ripens and becomes hard grain. Then they change colour, become white, and then light yellow, and the plants droop with the weight. Then stop irrigating the field and let it dry. This helps the grains of paddy to dry and become hard. If it rains at this time, the grains drop off and lose their flavour. When the plants are dry they become

TRANSPLANTING PADDY



yellow or golden-coloured. They are cut and bound in sheaves which are put on the threshing-floor.

How Paddy is Prepared for Use

Next, men and women take the sheaves and beat them on the ground. Most of the grain, especially good, ripe grain, falls off. In order to thresh the rest they make oxen tread on the heap. Now the grain is separated from the straw. The paddy is then winnowed so that the chaff flies away and the grain is gathered in the granary.

BOILING PADDY. Put some measures of paddy in a caldron or a big vessel. Pour the same amount of water in, mix it well, and boil it. Do not take off the cover often. In some parts of the country the paddy is allowed to soak in water for seven or eight hours before boiling. The boiled rice is dried in the sun for some time and then in the shade until it is ready to be pounded.

MILLING THE PADDY. Before rice-mills came to the land women did most of the pounding. Rice pounded at the mill should be aired well. This rice loses much of its bran and the vitamin contained in it. Good rice should have full grains, all the broken ones and stones being removed from it, and it should be dried well. When you take rice to the mill, ask the man not to polish the rice. Polishing the rice costs more, and removes all the most nourishing part of the rice.

COOKING RICE. Wash the rice and take out the stones. Do not try to wash away all the bran. Some prefer white rice to red rice, but the latter is better and is said to contain more protein than the other. Straining the water from the rice also robs it of some of its protein. Raw rice is the best. It is used by Brahmins and by Telugu people.

PRACTICAL WORK

PROBLEM. To cook rice without straining off the conjee-water.

MATERIALS REQUIRED. Three fireplaces, three aluminium vessels with covers, water, some vessels for washing the rice, firewood, $\frac{1}{2}$ measure of the following kinds of rice : raw rice, samba, elephant-tusk rice.

Put the aluminium vessels on the fire. Pour into the first one $\frac{5}{8}$ measures of water and in the other two $\frac{6}{8}$ measures of water. Wash the rice and put it in when the water is boiling. Put the raw rice in the first vessel. Keep up the fire until it boils, stirring it often, then reduce the fire. Find out which rice boils first. One class found that the raw rice took 20 minutes to boil, Samba 30 minutes and Elephant-tusk 25 minutes.

But of all cereals rice is the poorest in protein, fat, mineral matter and vitamins and should be eaten with foods rich in nitrogenous substance as pulses, fish or ghee.

Good rice should be entire, clean and well husked and non-fermenting. It should not be mixed with any gravel or earth. New rice is apt to cause indigestion and diarrhoea. Rice should be stored in dry and well ventilated rooms having impervious floors. In hot and damp godowns, it ferments and becomes mouldy. When soaked in water diseased grains become opaque. Rice is frequently tampered with by traders, and old and new rice, or rice of different qualities are often mixed together and powdered chalk and lime usually added to give it an uniform appearance.

WHEAT

Wheat is the most important of all the grains. When ground and sifted it is separated into bran and flour. Flour is divided into three portions : Suji is the coarse grain derived from the outer coat of wheat and is most nourishing. The entire grain, atta, may be ground up and used for making conjee, bread and chapattis. This is most nourishing—but the bread made from American or Indian white flours lacks fat and vitamin.

Good flour should be white in colour without any smell or odour, silky to touch and hot. Fine wheat flours are apt to cause constipation. Flour should be stored in godowns with impervious floors.

The other grains mentioned, are comparatively rich in carbohydrates, are valuable for their mineral matter and are good for growing children.

GENERAL RULES FOR COOKING CEREALS (CONJEE)

Pour the cereal slowly into boiling salted water. Cook directly over flame for about ten minutes. Then cook slowly. The quantity of water depends upon the kind of cereal. The more economical method of cooking rice is by steaming.

QUESTIONS

1. For what reasons are the cereal products valuable ?
2. Compare the composition of the different grains.
3. What changes take place in the proper cooking of cereals ?
4. Give general directions for cooking cereals.
5. Why should a school child eat sufficient food before starting for school ?

PRACTICAL WORK

PROBLEMS. To find some substitutes for rice.

Wheat Conjee

Buy whole wheat and wash it well, and dry it in the sun. Pound it in the mortar until the husk is off. Clean it and then grind it, but not too finely. Make it into conjee, with milk and sugar to taste.

Wheat with Curry

After pounding the whole wheat to get off the husk, wash it and boil it in grains just as you boil rice, and eat it with curry.

Cholam can be used in the same way, also other country grains.

JAGGERY

Jaggery is a form of crude sugar which we get from both the palmyra and the sugar-cane.

1. Palmyra Jaggery

Before the flower-branch of the palmyra matures its covering is scraped off and for seven days both morning and

evening, it is beaten with wooden implements and pressed between them until it is made soft. The top is also cut off. The result is that the flower-branch does not bloom but is ready to give out its sweet juice. On the eighth day a small earthen vessel (*kalayam*) is so hung on the flower-branch that the sweet juice from it falls in drop by drop. In the morning and sometimes in the evening also the juice is taken out. Every day the pot is painted inside with *chunam*. Some palmyra trees yield ten measures of this juice in a day. Men climb the trees and pour out the juice into a basket (*kuduvai*) made of palmyra fibre. When they bring it down their wives and children receive it in big earthen pots.



The juice thus obtained is taken to the sheds erected in the palmyra topes and there the women-folk beat it and make jaggery, or candy (*karuppu-katti*). Generally they make fire-places of clay though some use iron ones now. They construct them in such a way that from one to seven pots can be put on one fire. The firewood used is what they get from the palmyra trees, namely its leaves, stems and other parts.

Six or seven measures of palmyra juice are filtered into a large vessel (*koparai*) and heated. The juice boils and bubbles up. Some powdered castor-seeds are thrown in to prevent the juice from boiling over. In half an hour's time the juice becomes brown in colour. In another half hour it becomes more brown. This is the 'soft-ball' stage, so called because when taken in a ladle and poured into water it forms into a soft ball. The fire is not increased after this. The syrup becomes solidified (or caramelized) and after fifteen minutes reaches the stage when it does not dissolve and disappear in water readily. The pot is taken off the fire and for quarter of an hour the syrup is stirred with a long ladle. When it is ready to harden it is poured into cocoanut shells that have been soaked in water. Very soon it hardens and is taken out of the shells easily. This is called round jaggery or cocoanut-shell jaggery.



CHILLU KARUPATTY or jaggery in small pieces, is better-tasting than the ordinary jaggery. It is made out of good, clear palmyra-juice. When it is boiled into syrup, green gram or

Bengal gram, sesame, cocoanut chips and dried ginger are added to it. It is poured into small moulds of uniform size, made in wooden planks. These pieces are like sweets.

PALMYRA-SUGAR CANDY

This is prepared in the windy season. Good, clear palmyra juice is boiled until the soft-ball stage, when it is dropped into another vessel which is set aside in a fixed place and not moved. On the fortieth day crystals appear in the pot. It takes from one to four months to get it all crystallized. Some of the crystals are as large as small stones.

SAND CANDY OR SARAL CANDY

This is prepared like ordinary jaggery, but when the syrup is thickening it is kept on the fire longer and then poured into a vessel. On the third day it is all sand or gravel-candy. A pot with a hole at the bottom is procured and a filter is put into it. The candy is poured in and water is sprinkled so that any syrup which is left may be filtered out. Next the candy is dried in the sun.

PRACTICAL WORK

MATERIAL REQUIRED :

Two measures of palmyra juice, a wide-mouthed pot, a ladle, castor-oil or powdered castor-seed, fireplace and firewood.

TIME : Two hours.

DIRECTIONS :

Pour the juice into the pot, and boil it over the fire. In twenty minutes it will bubble and boil over. Put in the powdered castor-seed (the size of a pepper) or two or three drops of the oil. It reaches the soft-ball stage in an hour and a half. Take it off the fire, stir the syrup with the ladle for ten minutes and pour it out into cocoanut-shells. This should weigh $7\frac{1}{2}$ palams when it is solid.

2. Sugar-cane Jaggery

Sugar-cane is stripped of its leaves and put into a sugar-cane press where it is squeezed very much as oil-seeds are in an oil-mill. The sugar-cane juice runs out and is put to boil in a vat or in pots over the fire. After it has bubbled up and boiled over seven times, which takes about two hours, it is reduced to one-third its quantity. The syrup strings when taken up on a stick. It is then poured out into pans or moulds to harden. This jaggery is used by the people of the districts around Madras, as palmyra jaggery is used further south.

PRACTICAL WORK

PROBLEM : To cook pure sweets for the home, to prevent children from buying dirty ones and very indigestible ones in the bazaar

Peanut Brittle—Melt two cups of sugar (in a pan) over the fire, stirring it constantly so that it will not stick to the pan. As soon as it is melted, remove it from the fire and stir in a cupful of peanuts or ground-nuts (already shelled) and pour it out to harden on a flat tin, marking it in squares before it is cold, so that it will break easily into uniform pieces.

Cocoanut Sweetmeats—Melt one viss of white sugar into a thick syrup. When the syrup is turning almost to sugar, put in the pulp of three good cocoanuts and keep on stirring until it becomes thick and falls in a mass from the spoon. Then take it off the fire and spread it on greased plates, cutting it into squares before it hardens.

American Fudge—Melt an ounce of cocoa-powder in one cup of milk and add two heaping cups of sugar. Boil until it hardens (not brittle) or reaches soft-ball stage (i.e. makes a soft ball in cold water). Remove it from the fire without stirring it and set it aside until it is perfectly cool. Then beat it with a spoon until it is creamy and pour it out on a greased plate, and cut it into squares.

CHAPTER VII

FAT

1. Composition

Fats and carbohydrates contain large amounts of carbon, and on this account are called fuel foods. Fats also contain hydrogen and oxygen. But unlike carbohydrates fats are not digested in the stomach. A ferment in the stomach breaks up some of the fat into a fatty acid and glycerine and final digestion takes place in the intestines. During digestion fat is emulsified, i.e., divided into tiny globules. When it is emulsified it looks like milk.

2. Function

Fats and oils like carbohydrates give energy, but they have about twice as much energy-giving power. We can compare them to a lump of coal and a block of wood. If they are of the same size and are burnt, we find that the wood will burn much more quickly and the coal will burn a longer time thus giving off more heat. By measurement it has been proved that one cup of ghee gives two and one-fourth times as much energy as one cup of sago. Fat like coal burns slowly and gives more heat. So the special function of fats is to supply energy in the most concentrated form.

3. Experiment :

Action of Oil and Water : Pour a little cocoanut or cotton seed oil into a test-tube, add the same quantity of water, and shake the tube, set aside for a moment and examine. Which material rises to the top ? Is oil soluble in water ?

Emulsion of Fat :

In a test-tube put a bit of soap and two tablespoons of water. Heat until the soap is melted. Add $\frac{1}{2}$ teaspoon of oil. Shake and examine. What familiar food does the mixture look like? Set the tube aside for a minute. Does the oil rise to the top? In what form does it now exist?

Note

If fats are emulsified by means of soap, where does the soap come from in the process of digestion? The soap is thought to be formed by the action of the alkali of the pancreatic juice upon some of the fatty acids formed by the splitting up of the fat. By means of soap thus formed fat is emulsified during digestion. Fats pass through the intestinal wall as fatty acids and glycerol and go to the blood to be burned in the muscles for fuel or to be stored as fat until needed.

4. Kinds of Fats

These are fats and oils. Oil is the liquid form of fat. But liquid and emulsified fats are most easily digested, hence more desirable.

		<i>Grammes of Fat in 1 oz.</i>	
<i>Animal Fat</i>			
Cream	5.2 gr.
Butter	23.1 gr.
Ghee	28.1 gr.
Cod-liver oil	28 gr.
Meat fats	26.4 gr.
<i>Vegetable Oils</i>			
Cocoanut oil	
Gingelly oil	
Linseed oil	
Ground-nut oil	
Olive oil	28 gr.
Cotton seed oil	
Mustard oil	
Cocogem	
Margarin	23 gr.

N.B.—One ounce equals 28.3 grammes.

5. Daily requirement of Fat

A vigorous man at hard labour can digest fat of any kind without any difficulty, and needs it because it gives so much fuel. Fats retard gastric digestion and delicate persons must be careful about taking it with other foods which are hard to digest such as palagarams and fried foods. We cannot get along without any fat because fat can be stored in the body to be used as it is needed.

An average boy or girl needs $1\frac{1}{2}$ to 4 oz. of fat daily or 25 to 75 grammes per day.

QUESTIONS

1. What is meant by a fuel food?
2. Why should fat be taken daily?
3. Compare the cost of different kinds of fat.
4. How is fat changed in digestion?
5. What food materials are rich in fat?
6. Refer to the protein chart on page 17 and work out the number of grammes of fat in a day. Are you getting enough fat in your diet?

OILS

The Tamil people use gingelly (sesame) oil for food purposes while the Malayalis of the west coast use cocoanut oil. Some Tamilians fry *appalams* or *pappadams* with either pure cocoanut oil or cocoanut oil mixed with gingelly oil. There are two other oils in common use,—castor-oil and margosa oil. Cheap oils sometimes used in adulteration of other oils are ground-nut oil and *pinna-kai* oil.

1. Gingelly Oil

Be careful in buying gingelly oil. Smell it to see if it is pure or adulterated with one of the cheap oils.

The gingelly or sesame plant grows to two or three feet. The tiny seeds are neatly arranged inside the pod. When they are ripe the plants are plucked and left to dry

on the threshing-floor. When they are dry they are beaten with sticks till the seeds are separated. These are cleaned and put in the oil-press. About one-fourth of a *kottai* ($15\frac{1}{2}$ measures) of oil-seeds can be put into the press at one time. To this are added in small quantities fifty palams of jaggery or crude cane-sugar and some water. For six hours the oxen turn the oil-mill and oil comes to the top, the residue becoming flat cakes. This oil is taken out with a spoon and poured into tins. The oil that is between the cakes cannot be taken this way and is absorbed by a piece of white cloth round a strong wire that is poked into all sides. About eight measures of oil are produced from $15\frac{1}{2}$ measures of gingelly-seeds. The oil is used for seasoning curries, frying vegetables and making sweetmeats. Some take it raw, like ghee, with their food. It is also used for oil-baths and for oiling the hair.

2. Coconut Oil

Ripe cocoanuts or copras are broken and the white pulp is dried in the sun, then it is put in the oil-press and oil is extracted just as gingelly oil is. Those who want pure oil in small quantities prepare it at home. They buy ripe cocoanuts, scrape the kernel and take the milk which, when boiled for a long time, yields sweet-smelling oil. Coconut oil is also used for curries and for making sweets. If prepared at home, as above described, it can be eaten with rice just like ghee. It is applied to heal wounds. Heated with eucalyptus or camphor it can be rubbed on the chest for colds or coughs.

3. Ground-nut Oil

Ground-nuts are broken and the kernels inside are put into the oil-press and oil is extracted as above. This oil can be used for making sweetmeats.

4. Pungakai Oil

The fruit of the Punga—(*Pongamia-glabra*) tree is the size of a gooseberry. These berries are dried in the sun, and the inner part is put in the oil-press.

5. Illupai (*Bassia Longifolia*) Oil

Illupai Oil is prepared in the same way.

This and also the two previous oils, are used for burning in brass or earthen lamps.

6. Castor-Oil

Ripe castor-seeds are boiled and dried thoroughly in the sun for two or three days. They are then cleaned and put in the mortar and pounded well. Then the pounded material is put in a large vessel with two parts of water, and stirred and boiled. Frequent stirring is very necessary. Water evaporates and oil floats on the surface. This is taken off with a spoon or ladle and poured into a small vessel. After all the oil is skimmed off, more water is poured in and boiled again. Again oil comes to the top. This less concentrated oil is called 'water oil' and is sometimes used for children. After all the oil is gathered, it is put on the fire and boiled like cocoanut oil. Some add onions to it. Then the oil is strained into a bottle.

Castor-oil is used for some curries like *dal* curry and fowl curry. It is burned in lights, as shown by its Tamil name, 'Light Oil'. Its chief use is medicinal, as a purgative. Indians use it in many ways. For dysentery they give it in milk. They mix it with *chunam* to rub on the outside of the throat for sore-throat. They mix it with milk to wash out coal-dust from the eyes. They use it freely as a purgative in the hot season, believing that

it cools the blood. In Tinnevely district many use this oil for their hair and for oil-baths.

7. Margosa Oil

Margosa seeds are gathered and dried. The hard covering is removed and the kernel is put in the oil-press. People use this oil for lamps.

PRACTICAL WORK

Problem : To make castor-oil.

Materials Required : Fire-place, firewood, an earthen vessel or *chatty*, two other vessels, mortar and pestle, half a measure of castor-seed, one onion, fifteen cummin, a few curry-leaves.

Time Required : An hour and a half.

Directions :

The castor-seeds should have been boiled and dried thoroughly two or three days before. Pour one measure of water into the *chatty*. Clean and pound the castor-seeds until oil oozes out. Put them in the boiling water and heat them further. Stir them well. In an hour's time the water evaporates and oil floats on the surface. Strain the oil into another vessel and take the *chatty* off the fire. Pour some warm water into the *chatty* and stir it well. Some more oil rises. Skim that off and add it to the other oil. Next put on the fire the vessel in which you have the oil. Put the onion, cummin and curry-leaves into it. Let it boil so that the water evaporates. Roll a small piece of cloth on a stick and dip it into the oil to test it. If it burns well then it is ready to be strained. Take the oil and measure it. You should have one-eighth of a measure.

SOME HINTS FOR THE USE OF OIL IN COOKING

1. If the oil is not pure it boils and bubbles over, therefore heat it with some tamarinds and chillies. Four chillies and the tamarind from one seed will be enough for quarter of a measure of oil.
2. Use a slow fire.
3. Do not pour water into the oil.
4. The flour with which you make sweets should be ground well. If it is not ground well they will be oily.
5. Do not wait till the oil boils over.
6. Stir the foods which you are frying in the oil and turn them over, lest one side be burnt.

CHAPTER VIII

VITAMINS

Composition

If you grow and keep well, you need all the substances called vitamins. Little is known about Vitamins except that they are necessary for health and growth. Chemists have not been able to separate them, for they exist in such small amounts and in such an unstable form. From experiments in feeding animals and from watching what people eat, we have found out what food contains them, and that they are absolutely necessary.

Function

The function is recognized by the definite symptoms which follow when they are absent from the food taken, or have been destroyed by the method of preparation.

KINDS

Vitamin A

Vitamin A is called the fat-soluble vitamin. It is found especially in animal fats, in which it is believed to be soluble, such as milk, cream, butter, cheese, eggs, liver and fish oils.

It is not found in vegetable fat, but it is present in green leaves, spinach, cabbage, carrot, tomatoes and sprouted dals.

If you live near open fields see how many green edible leaves you can find. Make a list of them and note how little they cost. Remember they contain this important vitamin, and that ordinary cooking does not destroy vitamin A. It is destroyed by long cooking and if the food is exposed to the air during cooking.

Experiments on white rats show that if they do not get foods containing Vitamin A, they decline in their rate of growth, lose their hair, have poor appetites, a bad digestion and eventually develop a disease of the eye. The eyes become inflamed, swell, shut, and finally go blind. If some food containing Vitamin A is added to the diet, the animal will promptly recover. Night blindness developed in a boarding school in India where the boys were not given animal fats or green vegetables. The doctor prescribed ghee and green vegetables and there was marked improvement. We read of similar experiences of doctors in China and Japan where the diet is mostly rice and is poor in animal fats, and green vegetables. This vitamin is important for good health and is a protection against disease, especially the diseases of the skin and mucous membranes.

Vitamin B

Vitamin B is found in many vegetables such as potatoes, spinach, greens, cabbage, peas, tomatoes, and turnips; in fruit such as oranges and guavas; in milk and eggs; in whole grains such as wheat, maize, cholam, cambu and ragi; liver, kidney and pancreas; and dals and nuts. It is not destroyed by cooking, but much washing of rice dissolves it out, and it is destroyed when soda is added to cooking vegetables. It is necessary to eat food containing Vitamin B to keep our bodies healthy and in good repair. It is a great aid to the appetite and digestion as well.

According to the diet of India, we ought to get Vitamin B mainly from the grains we eat. But if that grain is polished rice, then we do not get this vitamin, for it is found in the outer layers of grains. It is best to pound

the rice at home, and wash it as little as possible after pounding. Even then we will not get enough Vitamin B, unless we eat other foods such as dals, greens and nuts, and other whole grains like ragi and cholam.

There is a nervous disease causing paralysis, known as Beri-beri, which is very common in India and oriental countries. The people contracting this disease live mainly on polished rice and a limited amount of other foods.

This disease can be produced in pigeons and fowls fed on polished rice; but on giving Vitamin B, it is cured rapidly. With people it takes a longer time to cure. (See Col. McCarrison's *Study of Beri-beri in India*.)

Vitamin C

Vitamin C is contained in citrus fruits especially lemon and orange juice, tomato, yellow turnips, cabbage and sprouted grains. There is a small amount found in green vegetables and potato. There is a little found in milk but it is destroyed in heating. This vitamin is more sensitive to heat than A or B. The tomato does not lose its property when cooked, but as a general rule in order to get Vitamin C, these foods should be cooked for as short a time as possible. The strictly fresh food is essential.

Vitamin C is not stored in the body, so a daily supply is needed. When deprived of the vitamin, scurvy results. It is important in the development of bones and teeth and keeping the blood supply pure. It is essential to give babies who are fed on boiled milk, fruit or vegetable juice.

Vitamin D

Vitamin D is found in cod-liver oil, whale-milk and eggs, and is radiated through sunlight. A lack of this vitamin

causes rickets in children. The bones become soft and bend. It has been cured by treatment with sunlight or ultra-violet rays, or by giving cod-liver oil. When there is much sunlight in India, mothers ought to make use of it by allowing their children to run about in the sun.

Vitamin E

Vitamin E is found in grains, especially wheat germ, liver and leaves. When there is a lack of this vitamin there is failure on the part of the body to utilize iron, and anaemia results. Experiments on rats show that a lack of Vitamin E retards reproduction or the offspring is weak. Vitamin E is not affected by heat.

QUESTIONS

1. Name several ways of cooking vegetables. Which ways insure that the vitamins are not destroyed?
2. Compare the five kinds of vitamins with regard to the effect of heat upon them.
3. Name the edible greens. Why do they contain Vitamin A? (Refer to McCarrison's *Food*, Chapter X.)
4. Make a list of foods which contain very little or no Vitamins. (Refer to the same book, Chapters X-XII.)

PRACTICAL WORK

Problem : To make fruit jelly.

1 teaspoon or 7 grammes *agar-agar*.

3 teaspoons lime juice or orange juice.

2 teaspoons sugar.

Prickly-pear juice for colouring if desired.

Dissolve the *agar-agar* in water and boil it with the sugar. Remove from fire. Add fruit juice and colouring, pour it into a cup and set it in a cool place to harden. Serve it with milk and sugar or soft custard.

SOURCE-BOOKS USED

Dietetics, by Carter, Howe and Mason.

Newer Knowledge of Nutrition, by McCollum.

Laboratory Manual of Dietetics, by Rose.

CHAPTER IX

WATER AND ROUGHAGE

Introductory Experiments :

(1) Peel a potato and weigh it in a chemical balance, recording the weight in grammes to one decimal place. Put the potato away on a high shelf for a week, where no one will touch it. At the end of the week weigh it again and compare the second weight with the first. What change has taken place? Why? What percentage of its own weight has it lost? In the table of composition in the appendix find the percentage of moisture in a potato. Compare with your own result.

(2) Peel another potato and grate it on the cocoanut-scraper. Hold the pieces in a piece of thin cloth and squeeze them into a cup of water. What are the white grains that you find in the water? Open the cloth and look at what remains. You have squeezed out the nutritive elements and the moisture and have left only the *cellulose* or woody fibre, the skeleton of the potato. What per cent of the weight of the potato is the weight of the woody fibre?

When we look at the table of composition of common foods, we are surprised to find, in many cases, how low the percentage is of protein, minerals and other important elements which we have been studying. The bulk of our food consists, in most cases, of water and indigestible fibre.

I. WATER

1. Function

Water has many important uses in our body :

1. It is needed in every part of our body by the blood and the various tissues, to keep them moist, and to hold the various elements in solution. The supply must be maintained.
2. It plays an important part in digestion. While it does not change its own form, like the other food-stuffs, it holds in solution the other food-elements as it carries them through the body, thus aiding in absorption. It also stimulates the flow of the digestive juices.

3. It assists *excretion* through the skin, the kidneys and the intestines. We prevent our kitchen pipes and drains from becoming blocked with refuse by flushing them frequently with water. Similarly we need much water to help carry off the water-matter from our bodies before it becomes injurious to us.

2. Sources

Look at the tables in the Appendix. What foods contain the highest percentage of water? What foods contain little or no moisture? In addition to the water which you get in foods, how much water do you drink in a day? When do you feel most thirsty?

In order to perform these various functions we need at least four or five tumblers of water a day besides what we get in our food. If we are leading an active life, or if we are perspiring freely, we need six or eight tumblers a day. There is no harm in drinking water at meals, provided we do not drink while we have food in our mouths and thus 'wash down' the food without chewing it. As has been shown, water is an important preventive of constipation.

II. ROUGHAGE

Under the term 'roughage' we include the fibrous parts or cellulose of fruit and vegetables, and the bran-covering of grains, such parts as pass through the intestinal tract without being absorbed, and are expelled with the waste materials.

In preparing food for little children we have to squeeze the more nutritive parts of fruits and vegetables through a strainer in order to get rid of much of this indigestible material which is too much for their delicate systems. Such softening of the food, however, would soon have a bad effect

on any but very young children, by causing constipation. These indigestible materials give bulk to the food and stimulate the action of the intestines in pushing through the colon and expelling, together with this undigested residue, the waste products which are brought by the blood from the organs.

When grains are husked and polished and ground into flour by machinery, as is increasingly done in these days, all the outer layers of the grain are removed. As we have already learned in another chapter, these outer layers contain most of the mineral and vitamin contents of the grain, together with all of the husk or bran which is an important source of 'roughage'. The cows who eat the bran and drink the 'conjee-water' get the most nutritive parts of our rice! In America the companies who mill the flour now clean and prepare the bran and sell it in separate packages, so that people who suffer from constipation can eat a little bran with their *conjee* or bake it into cakes along with flour. In India we can buy 'brown rice' and 'red rice' which have still some of the outer layer on it, and can use cracked wheat and hand-milled *ragi* which give us the necessary bran.

While we need to have a certain amount of roughage every day, it is equally important that we should not load our systems with too much coarse material which may cause diarrhoea. Fruits and vegetables must be eaten every day, but must be eaten in moderation. Because a child is upset by eating five or six plantains or mangoes at a time, some mothers conclude that all fruit is bad for children. If the child ate one plantain or mango a day, in small quantities, only good effects would be noticeable. Similarly, many people have become prejudiced against the coarser grains—*ragi*, *chulam*, *kambu*, *thenai* and

varagu,—because they cause diarrhoea. A glance at the tables of Composition will show that high nutritive value these cheaper grains have, which are the bulk of the poor villager's diet, and the fodder of his cattle. Because they are hastily and carelessly ground, often on a mud floor where the flour is swept up with dust and sand, it is true that these grains do cause a great deal of intestinal obstruction. With careful preparation, however, these grains can form a valuable part of diet, in small quantities, to counteract the effect of eating too much polished rice and finely milled flour.

III. CONSTIPATION OR FAULTY ELIMINATION

If the colon becomes clogged with these masses of waste-material, putrefaction sets in and poisonous products are released which are absorbed by the blood and carried all over the body. This condition, therefore, causes headache, dizziness, pains, and general feelings of dullness and languor. It may, if neglected, pave the way for serious disease. It is very necessary that we eliminate waste materials at least once a day.

Some people have the habit of taking drugs, called purgatives or cathartics, at frequent intervals, to expel waste material. These medicines stimulate the intestine to great activity for a short time, but have no permanent effect. If one depends on drugs, the muscular walls of the intestines will become 'flabby' and unable to do their work without the assistance of increasing doses of medicine. In times of illness when recommended by a physician, these purgatives may be given, but in ordinary life it is far better to combat constipation by the more natural means of *exercise, habit and diet*. A few health-habits are here suggested which, by the exercise of some

will-power, can be so firmly established in youth that they may both conquer and permanently prevent constipation with all its attendant ills.

1. Exercise

Get some hard exercise every day to counteract the long hours of sitting in school. Walk briskly, run, jump, skip rope, and play active games. Sweep, grind curry stuffs and carry water. If you are already constipated, you will feel languid, lazy and head-achey, and it will take some will-power to rouse yourself to activity.

2. Habit

Form a habit of giving the bowels a chance to move at a regular time each day, preferably in the early morning. Choose an hour when you can feel unhurried.

3. Diet

- (i) Drink from six to eight tumblers of water a day, whether you are thirsty or not. The tumbler of water drunk when you first get up in the morning, a half hour before you eat, will help you the most, although it is hardest to drink. Some put salt in this early morning drink of water, saying that this will make it pass through the alimentary canal without being absorbed. Some find that to drink a cup of *hot* water in the early morning, starts the action of the bowels almost at once. In any case the early morning drink is an important health-habit.
- (ii) Eat plenty of *vegetables*, with their skins on where possible, both at noon and at night.
- (iii) Eat some *fruit* every day, even if it is only a plantain or a prickly-pear fruit. Be sure that it is *ripe*.

- (iv) In place of rice-conjee or cakes made of rice flour, eat conjee or cakes made from the coarser grains for your morning-meal, i.e., ragi, cholam, kambu, or cracked whole-wheat.
- (v) If you are in the habit of buying polished white rice, buy brown or red rice instead.

You may find the above rules much harder to carry out than a weekly dose of castor-oil, but your efforts will be rewarded by the gift of Health.

QUESTIONS

1. Plan a week's diet for a person suffering from constipation.
2. In what ways do we lose water from our bodies?
3. Why are we most thirsty in hot weather?
4. It is often said that sick people must not be given any water, although they beg for it. Is there any foundation for this belief?
5. Experiment with ways of preparing and cooking the coarser and cheaper grains.

CHAPTER X

REFORMATION

It was the last class on Food at the Mothers' Club and fifteen mothers were sitting in a classroom at the girls' school discussing what they had just learned about the balanced diet. At a previous class they had weighed one person's food for a day, of the sort and quantity that they all ate in their homes, to calculate how many grammes of protein, fat and carbohydrates they were eating. Mrs. Ranganathan found that by these calculations each member of her family was getting each day : *

Proteins (mostly pulses)	...	75 grammes per day.
Fats (vegetable, oils, cocoanut and a little ghee)	...	85 grammes per day.
Carbohydrates (polished rice and sugar)	... ..	643 grammes per day.

As she reflected further she realized that really only her husband was getting this amount. Sundaresan was doubtless getting far more fats and carbohydrates. She herself and the other children rarely ate the amount of protein here included. She had long since come to the conclusion that they all got very little in the way of vitamins and minerals, for all disliked vegetables and milk and rarely spent money on fruit.

On the board Miss Arokiam had written the following table :

THE BALANCED DIET*

FOOD ELEMENTS	AMOUNT PER DAY	NATURE
Protein ...	70 to 100 grammes according to age and activity.	One-third must be animal proteins, as milk-products, eggs or meat or fish. Vegetables proteins should include pulses and at least two cereals.
Fats ...	50 to 90 grammes according to age activity and digestion.	One-half should be animal fats (for Vitamin A) as milk, curds, ghee.
Carbohydrates.	250 to 450 grammes according to age or activity.	Mix the sources, getting them from vegetables, cereals and sugars. Avoid too much sugar. Avoid polished rice.
Vitamins and Minerals ...	.....	Will be sufficient if amount of vegetables and fruit is four times as great in weight as amount of meal and <i>dal</i> .

The mothers all realized that, in order to live up to this requirement, they must increase the amount of

1. Milk and milk-products, as curds, butter-milk, ghee.
2. Wheat, ragi, or other grains with more protein-content than rice.
3. Vegetables, including both tuber and root-vegetables and green leafy vegetables.
4. Fruit.

If these foods should be increased, the amount of rice and sugar would naturally be decreased. Moreover, Miss Arokiam explained that for children the fat should not be given to them in the form of too many fried palagarams. They should get their fat from the milk-products, and the

* McCarrison's, *Food*, pp. 112, 111, 38.

vegetable oils used in curry, or in roasted nuts. She reminded them of their earlier lessons in the physiology of



BUILDING STRONG AND HEALTHY BODIES

digestion. If there is too much of it at a time, it cannot be digested and the result is indigestion. Even older people cannot eat much fried food without suffering indigestion, how much less can children with their weaker organs.

Coffee and tea for children were also banned. They contain no nourishment at all except for the sugar and milk served with them which they can get without the harmful stimulant. Children's nervous systems suffer under too frequent stimulation. If they cannot drink plain milk, Miss Arokiam recommended for all but the baby, cocoa or 'Ovaltine' which are very nourishing in themselves as well as giving a flavour to milk.

The mothers were very thoughtful on this last day. They recognized the truth of all these statements, now

that they had learned the elements of the science of Nutrition. But how could they put them into effect?

‘My children simply won’t eat vegetables,’ one mother remarked while the others nodded their heads. ‘You say that the curry must not be too hot. If it isn’t hot, they won’t eat it. They take the vegetables and throw them away, and eat only the curry and rice.’

‘My husband simply won’t eat wheat,’ another complained. ‘I tried giving him wheat instead of rice one day, and he was angry.’

‘And milk!’ complained Mrs. Ranganathan. ‘Not even my baby will touch it. They throw it up if I force them to drink it.’

‘I know. I remember that I did the same as a child,’ said Miss Arokiam sympathetically. ‘When I was in the west, I marvelled to see how contentedly some English children eat only bread and milk, or plain vegetables and vegetable soups without any pepper or spice, and drink cup after cup of milk. And their children are fat and sturdy compared to ours. Ours are thin and nervous and they cry a great deal. But I have seen some Indian babies, whose mothers fed them and trained them properly, grow just as fat and healthy. I have thought about it a great deal and I think the difference is just this. We feed our children everything which we eat from the time their teeth come, is it not so? We let them have a taste of hot curry, or we put a palagaram in their hands, or when we are travelling we give them *muruku*.’

‘How can one refuse when the child cries for it?’ demanded a mother indignantly.

‘It is hard, but once the child tastes the spicy food, and the very sweet food, its taste is spoiled for the plain and nourishing food. Now if we could prevent the baby

from ever getting a taste of coffee or curry or spice, he would never miss it. Isn't that so ?'

'But what about these children who have tasted it and eaten it for years ? How can we change now ?'

'I suppose the only way is to starve them into it. Give them nothing else. Not the grown-up people of course ! They have a right to choose their food. But we want to train the children to be wiser. Have none of the wrong kind of food in the house, and give them no money and no chance to go to bazaar. They will make a fuss and refuse to eat it, and perhaps starve for a few days, but in the end, hunger will conquer them, and they will be glad to take what there is, and then in the course of time they will get used to it.'

There was a storm of protest from all the mothers.

'What ! Starve our children !'

'I cannot endure to see them unhappy. I love them too much.'

'No, no ! We are not these hard-hearted westerners. We Indians love our children.'

'Yesterday,' continued the teacher, 'a little boy came to the dispensary with his right arm broken. He fell off a wall. His mother brought him to the doctor. The bones were all crooked. The doctor tried to take his arm to straighten the bones so that they would heal, but the child cried because it hurt him even to have his arm touched. The doctor called two nurses to come and hold the child down so that she could straighten the bones and bandage the arm, but the mother snatched him away and held him. "You shall not hurt my baby !" she said. "But I *must* hurt him if his arm is to be straight," the doctor said. "No", answered the mother, "let it be as it is. I cannot bear to hear him cry." "Then go

outside and wait", said the doctor. "Unless I hurt him he will have a crooked right arm all his life." "You are a hard-hearted woman," retorted the mother angrily. "You do not know a mother's love. I will not let you touch my child." And she actually took him away with his arm just like that.'

'What foolishness!' exclaimed a mother. 'Of course he must be hurt for a few minutes. What will he think of his mother's love when he becomes a man with a useless right arm?'

'A foolish, ignorant woman!' they all agreed.

'When the doctor put a knife into my Sita's throat to cut out her tonsils, it was as if she cut me,' said Mrs. Ranganathan, 'and the child suffered many days. But now she is much better for it.'

'You mean,' said another mother to the teacher, 'that if we refuse to starve our children into eating the right food, we are as foolish and silly as that mother. Oh, you are very clever with your stories!' and they all laughed, and got up to go home.

As Mrs. Ranganathan rode slowly home in her cart, she thought very seriously about that little boy with the crooked arm. Was she letting her mother-love do her children as much harm as that? Was she crippling their bodies because she was afraid to see them unhappy for a few days? It was an unpleasant and uncomfortable thought, but she was a sensible woman and she faced it.

When she got home, she talked it over with her husband and with Kamala, both of whom were much interested in the subject by this time, and won their co-operation. They mapped out a plan of campaign, thought it over carefully, and finally put it into effect.

When the children came to the kitchen for coffee one

morning they found none made except for their father. The rest were offered a new brownish drink called cocoa which Kamala had learned to make at school.

‘Chee!’ exclaimed Sundaresan, spitting out the first mouthful. ‘What are you giving me?’

‘It’s milk. You can’t fool me,’ said Sita, flinging down her cup.

‘This is what comes of learning English ways at your school,’ said Narayanan, disdainfully. ‘Why should we eat western food?’

‘It is *not* western,’ retorted Kamala. ‘You just look in the geography and see where the cocoa-bean grows. Why should we ship it all off to the western countries?’

They stormed and fumed and pleaded with their mother, but she was adamant. They appealed to their father, but he gave them no help. Nor could they get any pocket-money out of him. The only thing they could do was to try to pour the cocoa down the drain, but this was prevented just in time by their mother. ‘You may want it later,’ she remarked calmly, and set it aside on a shelf.

This was only the beginning of a different day. When they assembled for the nine o’clock meal, they were given cracked, boiled wheat to eat with their curry. No rice! And the curry was so thick with vegetables and *dal* that they could not escape them. And the curry was different; it was *flat*! The children made faces and spat it out. Sita tried to get up and throw hers away, but her father sternly prevented her.

‘You need not eat it if you don’t want it, but you are to sit still till we all finish,’ he decreed, while he and Kamala ate bravely on. Kamala nearly choked over it, but she had allied herself with her parents so she pretended

to like it. Mrs. Ranganathan was distracted by the howling of the baby who had refused both milk and conjee, and was expressing his opinion of this unusual treatment. The other three children sat in grim silence, refusing to eat. Strangely enough, neither father nor mother seemed to notice. No one coaxed or persuaded them. When their father had finished, they accepted plantains and ate them unwillingly, feeling very sorry for themselves.

That noon when Sita and Kamala retired to a corner of the school compound for their tiffin, Kamala produced a tiffin-carrier of rice and curds, and lime-juice instead of coffee to drink. Sita was hungry but she refused to touch it. She demanded the usual palagarams, but Kamala showed her that she had none. She begged for money to run down to the sweet-meat seller at the corner, but Kamala had none, and prevented her from borrowing any.

At home the boys were faring equally badly. Narayanan came in from his prescribed morning-walk feeling very hungry, and demanding palagarams. His mother offered to heat up the morning cocoa or milk, or the morning's wheat and curry, but there was nothing else except the raw eggs which the doctor advised. He refused them all, and flung himself down indignantly on his cot. He would die, and then his mother would feel sorry. Sundaresan came in at twelve loudly demanding food.

'The doctor says you may have rice only once a day,' replied his mother, offering him a small quantity of the morning's wheat and curry. He wept and stormed and threatened to kill himself. His mother hardened her heart. This was terrible, but she must carry it through. The baby added his howls to the turmoil, for he was being

offered mashed potato and brinjal mixed with half a soft-boiled egg, and the loathsome milk he had already refused three times.

At four o'clock, there was only the same old cocoa and some *illi*. They ate the latter, and more plantains. Sita and the baby were offered milk and wheat-conjee at six o'clock, which they indignantly refused, but after their mother left the room, Sita drank some, and finally finished it with the baby's help. She pretended to have spilled it. Then, crowning indignity, they were both put to bed at seven, to keep each other company. They howled in chorus, despite their father's stern commands, until at last they fell asleep exhausted. Meanwhile the others were called to eat at seven-thirty, and found rice at last, but with more mild curry and vegetables and curds. Sundaresan, who came in at nine o'clock from a cinema, was informed that thereafter he would get nothing if he came late.

And so the days went on. Fortunately Mrs. Ranganathan had a stubborn side to her nature. The more fuss her children made and the more angrily her visiting relatives and neighbours protested, the more determined she was to prove herself in the right. Fortunately, too, her husband upheld her. It was he who insisted that she should set the food before the children and leave them to eat it or not eat it, without coaxing and persuasion. He had read in a book that refusing to eat was only a way of attempting to attract attention and he believed it. She found that, little by little, they began to eat when left alone. Even milk and conjee, which they swore never to touch, vanished as rapidly as palagarams ever had. She rarely spent time squatting over a pan of oil, frying pastry and palagarams. Instead she pounded wheat, experimented

with ragi, prepared vegetables in different ways, and learned to make her own *ghee*. During the rains Narayanan, who was still out of school, helped to get the tangle of prickly-pear out of their back yard so that they could make a garden as the doctor had recommended. He planted vegetables and flowers, and enjoyed tending them. Sita, who was allowed to go to school only in the morning, helped him. Their father brought home small papaya and guava trees to plant, and soon the whole family was absorbed in growing things. Sundaresan had joined the Boy Scouts at his father's insistence, and was out every afternoon either with them or playing football or hockey. Now that the music lessons had been stopped, Kamala stayed at her school sometimes to play badminton and came home feeling so refreshed that she finished her lessons and fell asleep soon after nine. Even Sundaresan studied hard without a tutor and got better monthly marks, for he felt better and his mind was clearer now that he ate less and exercised more.

At the end of the school year a remarkable thing happened. Sita, who had attended school half a day only, passed and was promoted. Her mother took her to see the Doctor-friend to tell her the good news. The doctor exclaimed at sight of the child :

‘ I should never know her ! How she has grown ! And see how fat she is ! Did you really carry out all that I told you ? ’

‘ I really did, Doctor Amma,’ beamed the proud mother. ‘ But think of her passing when she only studied half a day ! ’

‘ I am not at all surprised,’ asserted the doctor. ‘ She was fighting against great difficulties before. She wasn’t getting enough oxygen. Those hookworms were stealing

her strength. She wasn't getting the food her growing body needed, and she was too tired to digest what she did get.'

'Now she drinks three or four ollocks of milk, and she eats conjee and vegetables and fruit,' boasted her mother. 'And she sleeps at noon and sleeps from eight o'clock at night. Is it not a miracle?'

'No miracle at all,' said the doctor. 'I wish we could have a few more mothers like you in this town. Is it a miracle for plants to grow when they have sunshine, manure and water?'

At the doctor's request Mrs. Ranganathan brought her other children, to be examined and weighed. Sundaresan found that he had actually lost ten pounds. Kamala had gained twelve pounds, Narayanan nine, Sita seven and the baby three. Narayanan's lungs were so much improved that the doctor promised him that he might attend school in June if he would drink milk and eat raw eggs all summer. His eyes were quite well. Kamala reported that she never had fever nor headache any more, and her blood was as bright red as the best blood on the chart. She was so well now, and so ready to eat what was set before her, that her parents were actually going to let her finish High School.

'I can hardly wait for that school-doctor to see them at the next physical examination,' confided the mother. 'Will he say now that my children are not properly fed?'

'You need not worry about that. If they keep on as they are, they will be the best-nourished children in town, and they will be grateful to you all their lives for the gift of Health.'

Mrs. Ranganathan turned back as she was at the door.

‘ But, Doctor Amma, it was only by chance that my eyes were opened. Can not all women be taught these things from the beginning? If the mothers and mothers-in-law could learn what I have learned, what a difference there would be!’

SOURCE-BOOKS USED IN THIS CHAPTER

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G. P. Putnam's Sons, N.Y., London, 1927 ; pp. 97-241.
Willard and Gilletts' *Dietetics for High Schools*, Chapter on Feeding the Child.

REVISION OF NUTRITION

PRACTICAL WORK

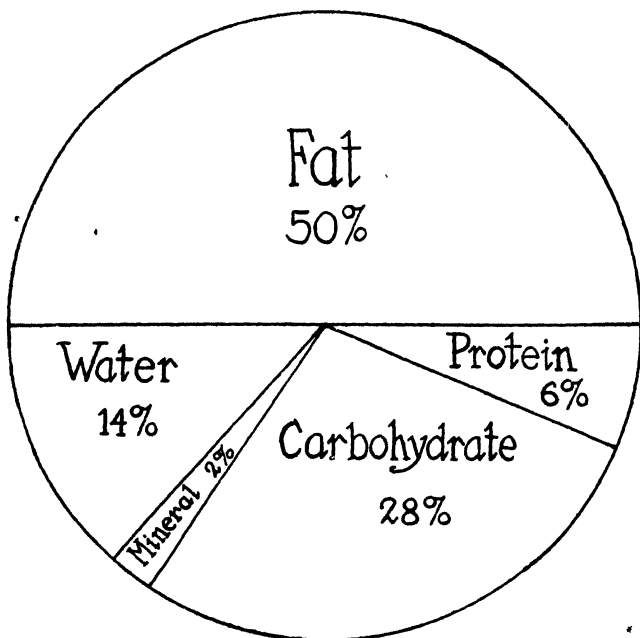


CHART SHOWING COMPOSITION OF COCONUT

Make a set of charts like this to help you remember the proportion of different food elements in common foods.

Directions : Find the percentage composition in the table at the back of the book. Use compass and protractor. Remember that the sum of the angles at the centre is 360° . To represent 50 per cent Fat, measure an angle at the centre which is 50 per cent of 360° , and proceed in this way. Colour each sector a different shade, and keep the same colour-scheme throughout your series of charts. Any left-over sector may be marked 'Woody Fibre'.

PART II

Child Welfare

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HUSBAND AND WIFE

As a river loses itself when it blends with the ocean, so the bride becomes one with the family of her husband.

This is no mere marriage; it is the blending by love of their lives in one. And how can our words describe such a union?

Drenched by the billows of joy and sorrow in the ocean of life, this bond of love emerges, rendered indissoluble for evermore.

Ever on the hearts of husband and wife nectar is sprinkled; and by it the bond of joy and sorrow grows firmer, more divine, more lovely.

The relationship of husband and wife is full of love, yea, it is all pure love. The fragrant, cool wind of love fills their whole world.

Those are called husband and wife who have one soul, though their bodies and feelings be divided.

They are like two wheels in the cart of life; and vainly will one try to draw it without the help of the other.

Where this is not so, life is but wearisome. Apart from his wife, a husband is lame; and so is she apart from him.

When oil and wick combine, the flame leaps up; so, in the experience of the world, union alone is potent.

Lakshmi Bai Tilak, translated from Marathi.
(From *Poems by Indian Women*).

THE LIVING DOLL

Look, she is a living doll. As the fruit of a thousand births, as a reward for a thousand austerities, she had favour on us at break of day and came. To welcome her the dawn maiden with swift hands made blossom and bud to flower; when they heard that she would come to earth the sweet singing birds carolled welcome with dulcet voice; the morning breeze said softly to all men, 'There comes to earth a flower from heaven.'

Look, she is a living doll. Three months and six days ago she came to the dwelling of men; and even to-day she is weighed down with incessant sleep. She knows not day and night; tears, joy, love, laughter are all unknown; the maid is without consciousness, without error. Yet her own folk come running to her each moment like bees covetous of honey. When she bursts into laughter, all laugh too. What limitless power is in her little heart!

What a living doll she is! At the fragrance of her body all the world smiles; sephalika and bakul flowers shower down abashed. In her baby babble what music pours forth; in all the world where is its like? When rishis and sages see the moon of heaven shine upon her face, their hearts are moved within them.

Look, she is a living doll. All day long with fascinated, unblinking eyes I look, yet the sting of unsatisfaction is within me. Love or joy she has taken away, poetry and memory too; she has snatched away my whole heart. Whenever I go anywhere, in a moment I come back and look. In truth she has made me a mechanical doll. Without her the world is empty; vice and virtue I forget. Blessed is thy power, and thy glory incomparable.

Pankajini Basu, translated from Bengali.
(From *Poems by Indian Women*)

INTRODUCTION

THE CHILD WELFARE MOVEMENT

Educated women can learn from books and from doctors about the care of their children, but educated women are only about two per cent of the women of India at present. What about the others? Are their children to be left to die? Millions of mothers have



SOME OF MOTHER INDIA'S CHILDREN, AT A BABY WELCOME

enough money to give their children proper food and care, but for lack of knowledge they waste the money on jewels

or on ceremonies which do the child no good and may do harm. Other millions have no money at all. Starving themselves, they cannot feed their children anything but the coarse grains or the toddy with which they keep themselves alive. No wonder the death-rate is high. The educated women, even though they be few in comparison, are setting themselves to the great task of saving India's babies. Unless everyone helps, their task will be very slow, but if each girl pledges herself in her school days to join in this Crusade, we may hope to see great changes in the next half century.

In Delhi we find established the 'Lady Chelmsford All-India League for Maternity and Child Welfare'. This League works among three lines:

i. The establishment of 'Health Schools' where nurses and midwives are trained to be Health Visitors, that is, to visit expectant mothers in their homes, advise them and teach them how to look after themselves, and get them to come to a Child Welfare Centre, where they may have medical attention and, if necessary, food. Important Health Schools are situated in Delhi, Calcutta, Lahore and Madras.

ii. The opening of Child Welfare Centres or 'Baby Welcomes', where mothers and babies can get needed help and where mothers can be taught.

iii. Propaganda work, that is, the spreading of information about the care of babies. This is done by the publication of books and pamphlets, the showing of cinema films, the arranging of meetings, lectures and exhibitions, and the holding of 'Health Week' celebrations all over the country.

More intimately connected with us is the 'Madras Presidency Maternity and Child Welfare Association',

which was organized in 1921 under the leadership of Lady Willingdon. This is connected with the All-India League, which assisted it, by means of grants, to embark upon various activities. Baby Welcome centres were opened in different parts of Madras, and in various towns in the mofussil, with the help of local subscriptions. In each of these centres there is a resident.

When we compare this state of affairs with conditions in England and America, we find that there the death-rate is slowly decreasing.¹ Some years ago a campaign in America had, as its slogan 'Save the seventh baby!' because the attention of the people was called to the fact that one child in seven had died the year before. As a result of increased efforts through such health-campaigns, child-welfare centres and education of the public, the lives of thousands of babies are being spared. Not only babies, but mothers too are saved by the newer knowledge of sanitation and hygiene. In London one mother dies for every 327 births, while in Madras one mother dies for every 60 births.²

Now let us inquire into the causes of this high death-rate among mothers and babies in India, in order that we may determine for ourselves whether these conditions are, as many say, 'the will of God', or due to man's ignorance of God's laws.

First in the list we must place Child Marriage. Because of this custom young girls are made to take up the burden of motherhood before they are fully developed or physically fit. Many babies are lost because of the immaturity of their mothers.

A second great cause is Ignorance. How few mothers in our land know anything about the cause and prevention

¹ *Maternity and Child Welfare*, by Dr. A. Lakshmanaswamy, p. 4.

² *Ibid.* p. 6.

of disease, prenatal care, infant feeding, or proper care of the child in the first years of life !

Then there are the various Infectious Diseases which attack both mother and baby,—diseases such as tetanus, pneumonia, dysentery, diarrhoea, malaria, which could be prevented if the mother had any knowledge of preventive medicine. Another disease which causes many deaths is syphilis, inherited by the baby from its mother. This could be cured before the baby's birth if the mother would go to the doctor.



‘POVERTY . . . STALKS THROUGH EVERY
VILLAGE OF OUR LAND’

Thousands of babies as well as mothers die because of wrong conditions at the time of birth. Instead of calling well-trained nurses or doctors or going to the hospital where proper care would be assured, the mothers suffer and die at the hands of superstitious and filthy barber-women who know nothing of cleanliness or hygiene.

Then there is Poverty, which stalks through every village and crowded city street of our land. Even if mothers know what to do for themselves and their babies, they cannot afford the nourishment and rest which they so sorely need. 'Poverty is never more hideous than when it assails the cradle and overshadows the child, blighting its whole life by its grim presence.'¹

These are some of the enemies of India's babies, and who shall say that their depredations are allowed or determined by God of whom it was said, 'It is *not* the will of your Father that one of these little ones should perish.' Every educated woman and girl in India must join in a great crusade against these rakshasas which are bringing sorrow and blight into the homes of our people. As the heroes and heroines of old went forth with swords and lances to meet the foe, we must fit ourselves to fight with the two great weapons of Knowledge and Service. The following chapters will serve to set your feet on the path to knowledge and perhaps arouse within you a desire to become a 'servant of India'.

¹ *Maternity and Child Welfare*, by Dr. A. Lakshmanaswamy, p. 19.

CHAPTER I

MOTHER INDIA'S CHILDREN

During Health Week a number of lantern-lectures were held in the hall of Kamala's school, and the older girls were invited to bring their mothers to attend them. As Kamala was very anxious to go, Mrs Ranganathan accompanied her, and took also her eldest daughter, Padma, who had returned home for a long visit before the birth of her first child. All three were so interested in the lectures that they returned night after night until the series was complete. Some of the talks were especially interesting to young girls like Kamala who were always thinking about their future, and others were valuable to the young wife, Padma, who was expecting her first child, and to her mother, who was anxious that her daughter should avoid her own mistakes. These were the lectures:

THE FIRST LECTURE: MOTHER INDIA'S CHILDREN

Infant Mortality

Those of us who are interested in the future of India and want to have a share in making it a strong nation, must remember that the health of any nation is dependent upon the health of its children. The degree of health which a nation has attained is indicated by the number of deaths in a year. In reading the statistics of Infant Mortality we find that India heads the list in the number of babies that die each year. Starting from Ireland and

travelling east and south there is a gradual rise in the infant death-rate until we reach India where probably one-fifth of those born die during the first year of life.

In 1923 in England sixty-nine out of every thousand babies died, while in Calcutta in that same year two hundred and eighty-seven babies died out of every thousand. In 1926 in the Madras Presidency the death-rate was 185.5,



TEN BABIES

Must two die out of every ten ?

—nearly two out of every ten babies. Of these nearly half died during the first month of life. In some cities in Madras Presidency the rate has gone as high as four out of every ten babies in certain years. What a waste of precious life ! It has been stated 'that somewhere in this Presidency an infant is dying every two minutes all through the year !' How many, then, have died since you got up this morning, or even since we began this subject ?

Perhaps you have visited the Baby Welcome in your

town early in the morning when the poor mothers bring their babies in to be bathed and fed. Sometimes a visiting doctor is there to examine the mothers and their babies, and give prescriptions or treatment or advice. Some mothers are fed with milk and ragi-conjee as well as the babies, and sometimes with this extra nourishment they are able to nurse their babies again. Mothers who have to work all day are urged to leave the babies at the centre in charge of the nurse, and there they sleep in cleanliness and quiet, with milk at regular intervals, instead of being lugged about in the burning sun. In 1928 there were eleven such centres in Madras and fifty-three in the mofussil. The expenses of such a centre are met by subscriptions in the town and by grant of the Central organization which sends around officers to inspect and advise the nurses. In each town, a committee of ladies takes the responsibility of raising money and supervising the work of the centre. Many Indian ladies give hours of their time and much of their money in this work for their poorer sisters. It takes a large heart and a spirit of unselfish and patriotic service, to look beyond the narrow domestic walls of one's own home and one's own family and take an interest in others.

These Baby Welcomes meet the needs chiefly of the poor. What of the equally ignorant mothers of the better classes who do not need money-help, but do need education about bringing up their children? Thousands of these are in purdah, and other thousands are afraid of doctors and hospitals. Propaganda work, especially during Health Week, by means of lantern-lectures, films, exhibitions and baby shows, is being promoted by many municipalities. It is hoped that through these, women may at least come to feel that doctors and nurses are their

friends,' not enemies, but progress is very slow. Government is trying to train to a higher standard of cleanliness and efficiency some of the barber midwives whom the people will trust, as well as placing well-trained midwives in each municipality. Schools are beginning to realise the importance of teaching girls about these matters, but in the mofussil only a very few girls study as far as the classes where they might be given such information. Women who realise that doctors are their friends, are given help and advice at women's hospitals. But with all these efforts the tremendous task is barely begun. Only the outmost fringe of people come within the range of these activities. Think of the millions in side streets and alleys of cities and towns, and in the myriad villages, who still know nothing but the old customs, who love their babies dearly but cannot save them by all their charms and brandings and offerings and tears. Notice as you walk through the streets, how many babies are thin, puny, scrawny or deformed or blind. Ask mothers how many children they have borne, and how many are now alive. Go into the dispensaries and hospitals and see the little girls whose health is ruined by too early motherhood. In all these ways you can make the statistics seem real facts and not just a jumble of numbers and words.

India needs a whole army of workers to attack this great problem. Children are always largely the business of women, so it is the women who must meet their need. Girls who have had some High School education can take three years' training in nursing and midwifery, and then a year at the Health School in Madras. They can then be in charge of a Baby Welfare centre, and organize the Baby Welfare activities of a whole town. They can be nurses or Health Visitors connected with a centre. As teachers

they can teach Mothercraft to girls who will some day be mothers. Married women who have children of their own can, by the way they bring up their own children, be an object-lesson to their neighbours. This is the most effective way of influencing others. They can visit a Baby Welcome helping the nurse. They can contribute money to this work, and serve on committees which are working to promote it.

If every girl who hears these words will begin at once to take an interest in the nearest Baby Welcome, and work toward one of the above goals, her influence will win many others to work for the children of Mother India.

'Usefulness is the rent we pay to God for room on earth.'

SOURCE-BOOKS USED IN THIS CHAPTER

Maternity and Child Welfare, by Dr. A. Lakshmanaswamy Mudaliar.

Report of Madras Maternity and Child Welfare Association, 1928.

CHAPTER II

THE SECOND LECTURE: THE BEGINNING OF LIFE

Motherhood as a Profession

In these modern days women talk a great deal about the professions which are opening to them—teaching, nursing, medicine and even law. Any one of these professions requires a long and severe course of preparation. We should not give our lives into the hands of a doctor who has not completed ten or more years of hard, scientific study of the human body, nor should we engage a lawyer to defend our rights were we not convinced of his ability to meet any emergency. And yet, how many thousands of women enter the most important profession in the world—that of motherhood, totally untrained and unprepared. ‘Oh, that is a matter of instinct!’ say some, believing that with the baby will be born full knowledge of how to rear it. Mother-birds or mother-cats may have such unerring instincts but human mothers have intelligence with which they can learn the laws of body and mind and be guided by the accumulated wisdom and knowledge of the ages. It is not safe to trust the advice of ignorant grandmothers who are ruled by custom rather than wisdom. While some customs are doubtless good, many have proved dangerous and fatal, as the statistics already quoted have proved. Every woman, whether she is to bring up her own children or the children of others, should learn the truth, so far as men have been able to discover it, regarding the laws that govern the body, and then try to put into practice the laws that she has learned.

The Beginning of Life

One of the greatest laws of Nature is Reproduction. When a tree dies, it leaves behind it countless other trees of its own kind to take its place. Were it not for this law, the earth would soon be empty of all plant and animal life. We have learned in Botany that the organ of reproduction in the higher plants is the flower. A grain of pollen from the stamens, passing down through the long style of the ovary, fertilizes one of the tiny eggs. If we planted the grain of pollen alone, it would not grow, nor has the egg any capacity for growth. But when the two join in one, a marvellous change occurs. The seed is formed which, when planted under right conditions, will grow into a new plant. By much the same principle the higher animals and man reproduce their kind. On either side of a woman's pelvic cavity is a small ovary filled with egg-cells which alone have no power of growth. It is thought that one egg-cell passes out each month through the Fallopian tubes into a muscular pear-shaped bag called the *uterus* and then out of the body through the passage called the *vagina*. After these organs are complete, in about the twelfth or fourteenth year the girl matures,—that is the menstrual flow from the uterus begins. But until she is eighteen or twenty her body is not fully developed nor her growth complete, nor is she of sufficiently mature mind to undertake the responsibilities of a wife and mother.

When she is ready in body, mind and character for this great responsibility, she may be married—that is, she may enter upon a life-long partnership with a man who should be her equal in strength and purity of mind and body, and should share her ideals and be in sympathy with her views of life. When two such kindred spirits unite to

form a home and rear a family, their union is not only physical but spiritual. As a result of their physical union a sperm-cell from the father joins with an egg-cell in the uterus of the mother, and this forms the seed of a new life. As a result of their spiritual union, the father loves and cherishes the mother, helps and protects and supports her through her days of weakness and suffering. Each lives for the other, and both live for their children.

As soon as the seed of the new life is formed, it begins to grow with amazing rapidity. You may have seen an amoeba, or single-celled creature, if you have examined a drop of dirty water under a high-power microscope. The human seed is first a single cell like the amoeba, composed of nucleus and protoplasm. The one cell becomes two. The two cells divide into four, the four into sixteen, the sixteen into two hundred fifty-six and so on. These cells become differentiated into bone-cells, muscle-cells and all the other kinds of tissues about which you have learned in Physiology, and so the human embryo develops. For nine long months this embryo is kept safely within the body of the mother, in the muscular bag called the uterus. The mother's blood carries to her child the nourishment and oxygen which the growing tissues need, and carries away the waste-matter. The mother must eat and breathe and live for her child. As an English poet says in a beautiful tribute to his mother :

‘ Through all the months of human birth
Her beauty fed my common earth ;
I cannot live nor breathe nor stir
But through the death of some of her.’¹

¹ John Masefield, ‘ *C.L.M.* ’

The mother has nine months of waiting, in which to prepare for her child. During these months she has time to sew the clothes which her baby will need, to make ready its whole outfit of bedding, towels, frocks, and warm wraps. She can find out through books and from her doctor all that a mother needs to know about the care and feeding of the baby at different ages. She can learn something, too, of the child's development in mind and character, so that she may avoid making blunders in training him from the beginning. She must be prepared to do the great work which will begin when her child is born, and to this end she will pray that God may give her strength and wisdom to train the child aright. But besides this preparation for the future, there is much that she can do to help the growth of the baby by proper care of herself during the time of waiting.

Note: For more detailed study of 'The Beginning of Life' both teachers and pupils are referred to the following books which should be in the school library :

For Girls and the Mothers of Girls by Dr. Hood : Bobbs-Merrill Co., U.S.A., obtainable at Higginbotham & Co., Madras

Growing Up by Karl de Schweinitz : Macmillan & Co., U.S.A.

The Way Life Begins by Cady, obtainable at Y. M. C. A. Publishing House, Calcutta.

A Clean Heart or Lessons on Motherhood by Mrs. West : C.L.S., Madras.

PRE-NATAL CARE

It used to be said that the foundation for the health of a child was laid during the first year of life. Now we know that we must go further back than this, to the period before its birth. By experiments upon animals we have found out that the care of the mother during pregnancy has a large influence upon the offspring, the diet being of special importance. Every baby has the right to be born healthy and the mother can do many things to

make him strong. A little care during pregnancy and a knowledge of the earliest signs of trouble will often save the life of the mother and child.

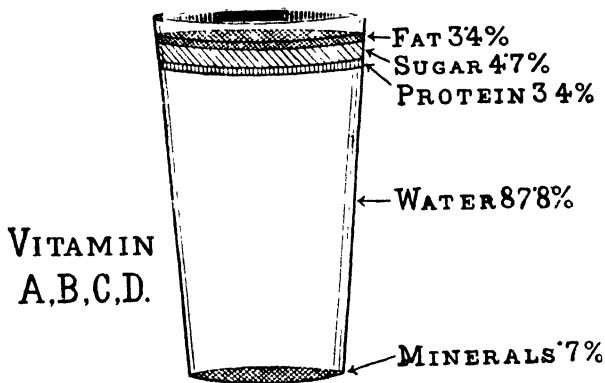
WHAT TO DO

As soon as a woman knows that she is to become a mother, she should place herself under the care of a doctor. If she cannot afford a private attendant she should go to a doctor at the nearest hospital or dispensary. Some hospitals hold weekly pre-natal clinics for expectant mothers. At this time she should lead a quiet life with an extra amount of rest in the day-time. She should have plenty of fresh air both day and night, and much sunshine. Sunshine is essential for it supplies to both mother and child Vitamin D without which they cannot become strong. Moderate exercise, such as walking and light house work are desirable, but heavy lifting and over fatigue should be avoided. It is especially important that an expectant mother should rest as much as possible during the week when her monthly period would occur were she not pregnant, for it is at this time that miscarriage (premature birth of the child) is most likely to occur. If she is working for her living, it is advisable that she stop at least two months before the baby is expected. To continue heavy work until baby arrives may do harm.

Bathing every day is necessary. The pores of the skin should be kept open as some of the poisons of the body are thrown off in this way. A mild soap will help to get rid of the grease which stops up the pores. Vigorous rubbing at the time of the bath improves the circulation and gives a sense of well-being. If the skin is not doing its share of excretion, extra work is put upon the kidneys, and trouble may result.

Her clothing should be light in weight and loose, with no tight bands around the waist. Her teeth should be kept scrupulously clean. She should take care not to break the mucous membrane of her mouth with pieces of charcoal, for a break opens the way for germs to enter and cause infection. Her bowels should be emptied at least once a day. If she is constipated she should overcome the condition by diet and exercise, or consult her doctor if these are of no avail.

Diet is the most important matter for the health of mother and child. A wrong diet affects the development of the baby. Not only should the mother eat enough food to nourish herself and the baby, but the food should be of the right kind, that is it must contain the proper elements for the building of muscles, bones, teeth, blood, and other parts of the body. It must contain calcium and



MILK. THE NECESSITY FOR MOTHERS AND CHILDREN
A Diagram illustrating the Composition of Milk.

phosphorous for bone and teeth formation, protein for muscles, fat for padding, sodium salts and iron for the

blood. It must contain, also, all the vitamins or body-builders, which are accessory to growth and development. *Milk*, whether of cows, buffaloes or goats, is a necessity not only for its nourishing qualities, but because it contains a great deal of calcium and Vitamin A. *Vegetables*, especially the green leafy varieties, contain many of the necessary minerals such as calcium, sodium and chlorine. They also prevent the blood from becoming acid by balancing the acid-producing tendencies of meat and cereals. They are a source of Vitamin A, B, and C, and they help to prevent constipation. The root vegetables, such as potatoes, are rich in carbohydrates and contain some minerals. *Fruit* should be eaten plentifully, especially oranges and tomatoes. Meat should be eaten sparingly. Of cereals *ragi* and *wheat* are of most value, and should be eaten at least once a day. Six tumblers or chembus of *water* should be drunk every day to help throw off the body poisons.

The expectant mother suffers at times from 'morning sickness', or nausea. It will give relief sometimes if she eats a biscuit or a piece of dry toast before she rises in the morning. When she feels sick she should lie down to prevent vomiting. If she suffers from varicose veins, they should be given support with a bandage, and she should avoid too much standing. It is very important that she cultivate a cheerful habit of mind, for anger or brooding may harm her health. 'A cheerful heart doeth good like a medicine.'

DANGER SIGNALS

If the mother observes any of the following symptoms, she should realize that they are signals of something wrong and go immediately to her doctor :

1. 'Persistent vomiting.

2. Persistent headache, spots before the eyes, dizziness, swelling of the feet. There is a general belief that swelling of the feet, ankles and face is natural at this time. It is often the first sign of kidney and heart disease, and the doctor will want to examine the urine.

Even if there is no swelling, the urine should be examined once a month for the first month, and once a week during the last two months.

3. Any discharge from the vagina especially if it is bloody. The common signs of miscarriage are pain and bleeding. If this occurs the mother should go to bed at once and send for the doctor.

4. Failure to feel life—that is, to feel the baby moving after once it has been felt.

If these, or any other unusual developments are reported to the doctor promptly, much trouble may be prevented.

WHAT SHE SHOULD PREPARE

The prospective mother should prepare certain things for the coming event. The amount and kind of equipment would naturally depend upon the financial condition of the family, and upon whether the baby is to be born at home or in the hospital. The ideal thing is for the mother to go to the hospital where she can have the best care with the least amount of effort on her part.

If the confinement is to be at home, the sunniest and lightest room should be chosen. There should be a table and several chairs in the room if possible. The bed should be firm and not too low. There should be a piece of oil-cloth to protect it, or else a protector can be made of newspapers covered with old linen or freshly-washed thin *kora* firmly stitched on both sides. This can be burned after use.

Supplies to keep on hand for the confinement are :

Clean sheets, towels and pillow-slips.

Clean white clothing for the patient.

Two basins.

Soap.

Hand brush.

Absorbent cotton in sterile packages.

Cheap cloth or any old linen, freshly washed, to make into pads and napkins.

Plenty of hot and cold water.

THE BABY'S OUTFIT

The baby's needs are few and everything should be as simple as possible. The following list can be modified according to the mother's ability.

1. Blanket to receive the baby when it is born.
2. Some small pieces of clean soft cloth, four inches square, for the cord.
3. Some bands of soft cloth, preferably flannel, eighteen inches long and five inches wide, to wrap around the baby's abdomen to keep the dressing in place.
4. Boric powder to dress the cord.
5. One or two dozen napkins or diapers, made of soft cloth, made square to be folded into a triangle. The square should be from a half to three quarters of a yard. If the baby is small it may have to be folded twice.
6. Baby slips or frocks, made simply of soft washable material. Some should be of flannel for damp days.
7. A few squares of soft cloth for washing the baby.
8. Soft towels for drying the baby.

9. A small blanket.
10. Two pairs of knitted booties.
11. Safety-pins, large and small.
12. Talcum Powder.
13. Soap. (Avoid scented powder and scented soap which injure the delicate skin.)
14. Gingelly or cocoanut oil.
15. A basket, 15 ins. by 30 ins., with pad, oil-cloth and mosquito-net if possible.

BIRTH

At the end of nine months the baby's body with its various organs is sufficiently developed to permit of its living apart from the mother's body. When the time comes the opening at the lower end of the uterus opens, and the muscles of the uterus contract to push the baby downwards into the vagina. When the mother begins to feel the pains of these contractions, she must put herself in the hands of her doctor or nurse. We have learned of the danger to the lives of mothers or babies caused by wrong conditions at birth. If an ignorant barber-woman is called, her dirty habits and wrong methods may cause the mother needless suffering and fever through infection. If she goes to a good hospital, or calls a well-trained nurse or doctor, she may have confidence that everything will be cleanly and skilfully done. After hours of pain for the mother, the baby is born and the cord through which it received nourishment from the mother's blood, is cut. With the first inhalation of air into its own lungs the child cries, and from that time its own organs are able to function. The mother can then forget her suffering in the joy of holding in her arms the child for whom she has prayed and prepared and waited so long.

CHAPTER III

THE THIRD LECTURE : THE CARE OF THE BABY

The Care of the New Born Baby

The nurse should receive the baby into a soft, warm blanket (if it is cold) and lay it in a convenient place, being very careful not to let the surface of the body be chilled, for that might cause death. After the mother is attended to, the baby should be rubbed all over with oil or vaseline to remove the cheesy material from the skin. It is then sponged with warm water and rubbed with a towel, and dressed. The baby should never be put into a bath-tub until the cord has dropped.

The cord must be kept very clean, otherwise there is danger of germs getting into the sore place and causing an infection which might bring about the death of the baby. The cord is sprinkled with Boric powder and a cotton square is applied and the band put on to hold the dressing. Pins should be put in front, not at the back.

BATHING

The baby should be bathed once a day, preferably in the morning just before feeding-time. A child should never be bathed just after having its food. The ideal thing is to keep a small tub or basin. The temperature should not be higher than 95° or 100°. The nurse or mother should test the water with her elbow, not with her hand, in order not to let it be too hot for the baby's delicate skin. There should not be draughts through the room to chill the baby.

Everything needed for the bath should be kept ready before beginning. Hold the baby on a blanket on your lap, taking care not to expose it if the weather is cool. Using a soft wash-cloth (not your hand) wash baby's face and scalp with a very little soap, then dry it. Then soap the entire body



BABY'S BATH

quickly and place the baby in the tub, supporting his head and shoulders on your left forearm while you sponge off the soap with your right hand. The baby should not remain more than a few minutes in the bath. Lift him out, wrap him in a soft towel and dry him quickly. He does not need powder except in the creases of his skin in hot weather.

If you bathe the baby without a tub, keep him wrapped in the blanket and wash and dry one part at a time, to avoid chilling.

The baby should be put to the breast twelve hours after birth. To have the baby nursed before this may result in vomiting which is hard to cure. The true milk does not appear until the third day after birth, but the secretion which is in the breast is beneficial to the baby. No other milk or castor-oil should be given. The nipples and the breast should be kept clean. The first day the baby should be nursed every six hours and then every three hours except at night. Some babies are trained from birth to have no feeding between ten o'clock at night and six in the morning. Others have one feeding at two o'clock until they are two or three months old. Both mother and child need sleep at night. At six months the child can be put on a four-hour schedule. Some babies are put on a four-hour schedule much earlier. The feeding should last from ten to twenty minutes, according to the amount of milk, and the baby should be given one breast at a feeding. It is most important to form the habit of regularity from the beginning. The mother should not nurse the baby whenever it cries, but watch the clock for the right time—six o'clock, nine, twelve, three, six and then ten. Nursing the baby every time it cries causes indigestion. Putting another meal into the stomach before the first is digested will even make a grown person sick. If the baby cries between feedings it should be given a little boiled water to drink.

FEEDING

A baby who is being nursed by his mother should not have cow's milk at the same time unless there is evidence

that the mother's milk is not sufficient for him. If he is happy and contented and is gaining in weight, with no vomiting or diarrhoea, we may know that the mother's milk is sufficient and that it agrees with him. The advantages of breast milk over cow's milk are many.

1. It is absolutely free from germs, and is clean.
2. It is always ready.
3. It is more digestible because it contains everything which the baby needs, whereas cow's milk is made for the calf.
4. It does not need to be boiled, so the vitamins are not destroyed.
5. It contains certain substances which help to protect the baby from getting contagious diseases.

These are some of the reasons why we find that one breast-fed baby dies to every five that are fed on cow's milk. In other words, a breast-fed baby has five times as good a chance of growing up as a bottle-fed baby.

THE NURSING MOTHER

If the mother is to provide her baby with the necessary nourishment, she must keep herself in good health and eat the food which will supply the needed elements in the milk. The mammary glands are the milk-factory which must be constantly supplied with the raw-materials—calcium, phosphorous, fat, protein, vitamins and others—which are to be manufactured into milk. The diet which has already been described for the expectant mother should be continued throughout the period of lactation, as well as all the hygienic habits of life which will keep her body in good condition. Not only will any illness affect the milk, but any mental upset, such as worries or shocks or bursts of anger. One mother confessed: 'I lost my temper yesterday, and my

baby cried all night.' The members of the family can do a great deal to help both mother and child by sympathy and consideration in sparing her from overwork and family cares.

ARTIFICIAL FEEDING

If the mother has tuberculosis, or if for reasons of ill-health she has no milk, she may use cow's milk for her baby. Some mothers are able to nurse their babies two or three times a day but have to give them supplementary feedings. When we compare the composition of cow's milk with the composition of mother's milk, we find that cow's milk contains most of its protein in the form of casein, which a baby digests with difficulty, while mother's milk contains most of the protein in the form of more easily digested lactalbumen. In order to reduce the quantity of casein, it is necessary to dilute the milk with water, and then, as a result of dilution, the proportion of carbohydrate becomes too small, so that sugar must be added. The doctor should be consulted for the exact amount to be given at each feeding, and the right proportion of milk, sugar and water. A good deal depends upon the richness or thinness of the milk. If the milk is good, the following may be taken as a general rule :

Formula

I. AMOUNT

For the first two or three months baby needs 3 ounces of fluid per pound of body-weight ; in latter months $2\frac{1}{2}$ ounces and from ten months on, 2 ounces per pound.

II. PROPORTION

For every pound of body-weight— $1\frac{1}{2}$ ounces pure milk.

$\frac{1}{10}$ ounce of sugar.

Water enough to make up the total amount.

N.B. 1 ounce—2 level tablespoonfuls cane-sugar.

1 ounce= $2\frac{1}{2}$ „ „ „ milk-sugar.

Milk-sugar is the most easily digested and can be obtained at a chemist's shop. If ordinary cane-sugar (white sugar) is bought in the bazaar, it should be dissolved in some of the water and strained through a clean cloth.

Equipment

I. BOTTLES

The bottles should be of transparent glass with a mouth wide enough to permit thorough cleaning. If possible the mother should have five or seven bottles, so that she can measure out the right proportions in the morning for the whole day, and fill all the bottles at the same time to avoid contamination, insure the same amount and the same proportion in each feeding, and avoid repetition of labour. The bottles can then be boiled all at once, for ten minutes, and left under water until the moment of filling, then stoppered with clean cotton and set aside. A few minutes before feeding-time the bottles can be put into warm water until it is heated to the right temperature.

If it is impossible to have so many bottles she should at least have two in case of accident, and be careful to wash and then boil them each time before filling them.

II. NIPPLES

Nipples should fit the mouth of the bottles. Once a mother brought her baby to the hospital again and again with diarrhoea. Finally the doctor asked to see the bottles with which she fed him. She showed the doctor a brass feeding-cup, around the spout of which a nipple was tied with twine. The doctor untied the twine and pulled off the nipple. The twine, the folds of rubber and the narrow spout were all filled with dried, sour milk which spoiled the fresh milk every time the baby drank, so it was constantly sick even though the milk was boiled.

Nipples can be put in to boil with the bottles for the last two minutes before the pot is removed from the fire. Longer boiling spoils the rubber. Before boiling they should be well washed with warm water and Boric solution or washing soda, and after boiling they, like the bottles, can be left under water until they are used.

Some mothers put dummy-nipples or pacifiers into baby's mouth to stop him from crying. This is a very bad practice for three reasons :

- i. It is always dirty. It drops on the floor and is put back in the baby's mouth, or flies light on it.
- ii. The baby sucks in gas which distends his stomach.
- iii. Constant sucking spoils the shape of the baby's mouth.

III. BOTTLE BRUSH

It is impossible to cleanse the bottles without a bottle brush.

IV. OUNCE GLASS

This is necessary to measure the proportions of milk and water, unless you have bottles with the measurements marked. The ounce glass must also be boiled.

V. SAUCEPAN WITH ITS OWN CLOSE-FITTING COVER FOR THE MILK

This sauce pan should be used for *nothing else* but the baby's milk. It should be well scoured after each using, and be kept clean and shining.

VI. A POT OR BASIN IN WHICH THE BOTTLES CAN BE BOILED

All of this may seem like a great trouble and expense, but no expense is too great when the baby's life is at stake. We have noted what a risk bottle-feeding involves. The reason is that there are so many opportunities for disease-germs to get into the milk. When a baby gets its mother's milk it gets milk exactly suited to its individual needs and gets it directly from the milk factory. Think of the many ways in which the cow's milk may be contaminated:

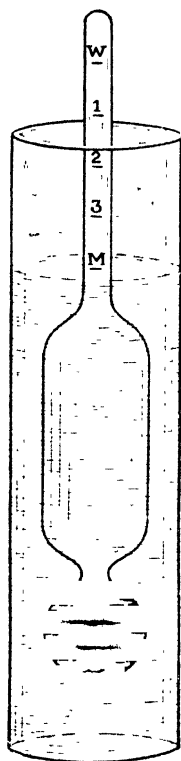
1. The cow may have tuberculosis, in which case tuberculosis germs may be in the milk.
2. The cow's udder may be dirty.
3. The milk-man's hand may be dirty, or he may wipe them on his dirty clothing.
4. The pan in which he receives the milk may be dirty.
5. He may dilute the milk with unboiled water.
6. The mother may leave the milk uncovered* for a time so that germs in the air fall in, or she may

- pick up a cover from a dusty shelf to cover the milk after boiling it.
7. She may be in too much of a hurry to wait until the milk really boils or bubbles. Germs flourish and multiply in warm, sweet milk. It should bubble for three minutes, being stirred all the time to prevent formation of scum.
 8. She may hold the bottle and the nipple in dirty hands, even after boiling them, or wipe the nipple on a dirty cloth, or she may put the nipple in her own mouth to taste the milk. Her mouth may be full of germs which she is strong enough to resist but the baby cannot resist them.
 9. Flies may carry germs directly from the latrine and leave them on the nipple or on the baby's lips, or in the milk.

Make a list of rules by which you can prevent contamination of milk in any of the above ways. Remember that germs are invisible and may be present on cloths or pans that look clean.

An alternative

If a mother is too poor or too ignorant to feed her baby with a bottle as above directed, here is the simplest and safest alternative. She can keep especially for the baby a glass tumbler and a teaspoon. She should find out, and scratch a line on the outside of the tumbler to show, how much milk is needed for a feeding. Both tumbler and spoon should be boiled just before the milk is poured in, and the mother's hands must be very clean before she begins to feed the baby by spoonfuls. This is a better way than the use of a *kindi*, or brass feeding cup. Silver or nickel is better than enamel for the spoon



A LACTOMETER

This is also a necessary part of the mother's equipment, so that she may prevent the milk-man from selling her watered milk. If the milk is pure, the line marked 'M' will be at the surface of the milk. If there is water in the milk, the line M will sink further down under the surface. Since some cows have very poor food, it is perhaps fairer to test your milk-man's milk as soon as it is milked, and note to what line the lactometer sinks when that particular cow's milk is undiluted. After that insist upon milk daily which comes up to that standard.

Look up 'Specific Gravity of Liquids' in a Physics book, and try to understand the principle of the Lactometer.

if possible, for enamel may chip off when it begins to wear out.

TINNED BABY-FOODS

In these days mothers are buying imported tinned baby-foods such as Glaxo, Mellins Food, Ideal Milk, Allenbury's, Lactogen and others. We may list the comparative advantages and disadvantages of these foods as compared with fresh milk :

Advantages

1. They are clean.
2. They are often more nourishing than any available milk.
3. They can be prepared quickly and easily according to directions on the tin.

Disadvantages

1. Having been dried at high temperature for preservation, they do not contain the necessary vitamins.
2. They sometimes make babies fat but not strong, because they have too large a proportion of carbohydrate.
3. They are expensive.

If the family can keep a good cow or buy plenty of good milk, it is undoubtedly better for the child to have fresh milk. If the milk does not satisfy the child's hunger, it can be made richer by the addition of barley-conjee, or very fine ragi-conjee, or may be supplemented by one or two feedings of a tinned food. On a long journey, or in a locality where good milk is not available, it may be necessary to depend on tinned foods.

SUPPLEMENTARY FOODS

Milk must be boiled in order to kill germs, but unfortunately in the boiling many of the vitamins are also destroyed. Babies who have boiled milk or tinned milk in place of mother's milk, must get their vitamins in another way. After the third week the doctor may recommend that they be given a part of a spoonful of diluted orange juice at ten-thirty every morning, midway between two feedings. At seasons when oranges are not available the mother may have tomatoes in her garden and use the juice of tomatoes or dilute prickly-pear juice carefully strained. As the child grows older the amount of water can be decreased until he takes more of the pure, strained juice. Codliver-oil or sun-baths will supply the necessary Vitamin D. Even babies who have mother's milk need these supplementary vitamins after three months. When the mother boils greens and brinjals to put in the curry, if she washes the vegetables very clean she can give the baby a spoonful of the water in which they were boiled. Some of the most valuable minerals and vitamins are dissolved in this water and will be helpful to the baby. Many Indian mothers are learning to use fruit and vegetable juices for their babies at their doctor's advice, and are finding that it helps them to grow and gain weight and have good, strong bones and teeth.

Whether the baby has mother's milk or other milk, we can tell by his weight whether he is getting enough nourishment. He ought to be weighed once a week. If he gains from five to eight ounces, we may know that he is doing well. If he loses or does not gain, the doctor should be consulted. If he cries constantly, it is very likely that something is wrong with his diet.



A PRIZE BABY

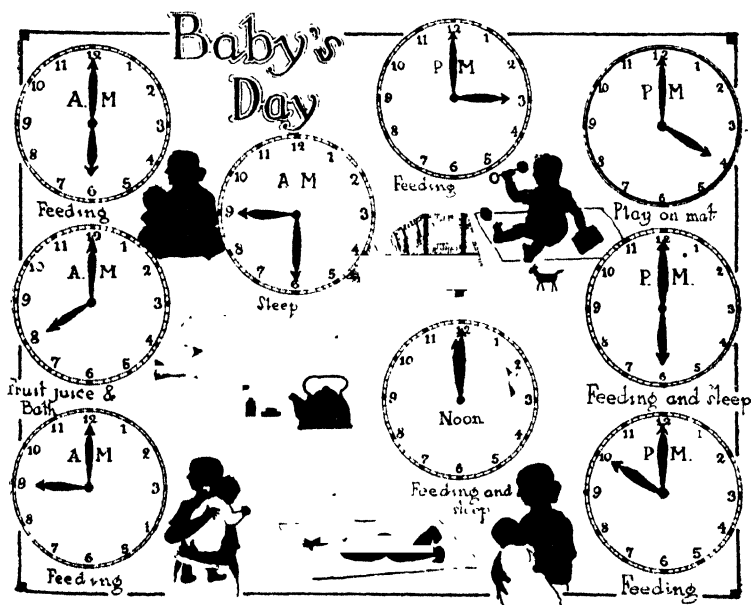
This baby won First Prize in a Baby Show. She is fed her milk regularly, by the clock, and she has orange-juice every day.

Changes in the Diet during the First Year

The breast-fed baby should be weaned whenever the mother's milk becomes insufficient, but in any case by the end of the ninth month. It is better not to wean babies when the weather is very hot, or when there are contagious diseases nearby. Weaning is done gradually. For the first week one feeding of cow's milk is given in place of one breast-feeding, then two feedings are substituted in the second week, three in the third week and so on until the child is taking cow's milk entirely. Since the child is not used to cow's milk, it must be diluted and sweetened

at first just as in the case of a three-months bottle-fed baby. A child of nine months can learn to drink directly from a cup without going through the intermediary stage of a bottle. It is bad for both child and mother to continue breast-feeding too long, and it should not be done except when the family is too desperately poor to buy milk. Once the child is weaned the mother should break the habit of nursing by never putting the child to her breast again. If he refuses the bottle or the cup, he must be starved until he learns to take it.

By the time the teeth begin to come the child will be drinking plenty of undiluted milk with very finely-



strained conjees. When the teeth come, the ptyālin is present in the saliva, so a little well-boiled and then strained

rice can be digested. An unsweetened biscuit or piece of dry toast will teach the child to chew and use its teeth. Fruit-juices and vegetable-juices should be increased in quantity, and a greater variety of soft conjee may be given. It is very important that the baby should never be given a taste of sweets or coffee or curry at this time, for if it once tastes highly flavoured foods it will constantly crave them at an age when they are very bad for its digestion. Its taste must not be spoiled for the plain nourishing milk and conjee which its growing body must have. At a year old, half a soft-boiled egg may be given with bread. A whole egg is too much at first. Meal-times should continue to be very regular, and nothing should be given between meals but water.

SLEEP

Not only food but sleep is essential to the growth and development of the baby. During the first two weeks of its life a baby should sleep from 20 to 22 hours a day, gradually decreasing the amount until at two years he is sleeping from 15 to 18 hours a day. He should take a nap in the middle of the morning and in the afternoon, and be put to bed early in the evening to sleep undisturbed through the night. From birth a baby can be trained to go to sleep by himself without rocking, trotting about or patting. If he has never been rocked or patted, he will not crave it, and will form the habit of going to sleep when he is laid in his basket. This habit can be formed by a little patience and perseverance on the part of the family. If the baby cries to be taken up, they should let him cry, and he will soon learn that crying is of no avail. Crying is exercise and will not harm the baby nearly so much as the habit of demanding constant attention. A

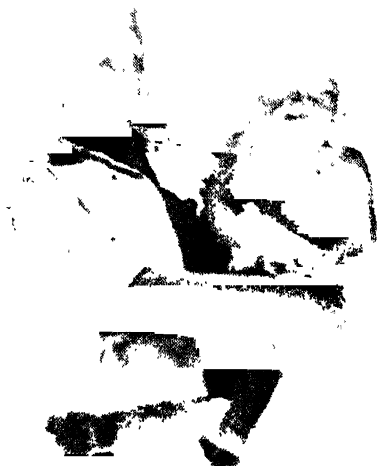
baby who lies quietly and happily in his basket, giving no trouble, is a great boon to a busy mother.

From the beginning the child should sleep separately from the mother. Both mother and child sleep better alone, and both need undisturbed rest. The baby needs space in which to turn and kick and stretch. A baby-bed or a basket afford space for movement and later can be used for him to sit in while he plays. The custom of putting the baby on the bare floor is a bad one, for he soils his hands and then puts them in his mouth, and in that way carries infection to the alimentary canal. If he is on the floor he must lie or sit on a clean mat or carpet.

During the hours when the baby should sleep, members of the family should not be permitted to disturb him or take him up to play with or to show to visitors. Baby is not a toy, but a living person whose rights should be respected. Just before he goes to sleep he should not be tossed about or excited too much for he will be so overstimulated that he will not go to sleep, and then will be cross and fretful. Regular habits of sleeping and eating will ensure good health and sweet temper.

Being carried about constantly on someone's hip is bad for the baby's health and character. His legs may become bowed from staying in that position. He cannot stretch and exercise his body symmetrically. He gets too much excitement from going everywhere, and he becomes so used to going about that he is unwilling to be left in bed for an instant. He becomes very dependent and demanding and a real nuisance to busy older people. It is not good for younger children to carry babies as the weight is bad for their growing bodies and there is danger of their dropping the baby or holding him in an injurious position.

The mother will save herself, the family and the baby from all these difficulties if she trains him from birth to lie and



A DESPOTIC QUEEN AND HER WILLING SLAVE

It would be better for both if she were left more to amuse herself. Why?

kick and amuse himself in his basket for a large part of the time without expecting handling. He should lie in the fresh air, on a shady veranda or in a shady corner of the courtyard if possible, not in the smoke of the kitchen.

CHAPTER IV

FOUNDATIONS OF HEALTH

At the time when the older children were on a strict diet Mrs. Ranganathan realized that her baby needed attention too, and took him to the hospital to consult her two friends. They told her that he was underweight for his age because he was getting neither suitable food nor sufficient sleep. Mrs. Ranganathan had been planning to enter him for the Baby Show during Health Week, but when she heard this she decided to wait for another year, and then make sure of winning a prize.

At her request Miss Arokiam the dietitian, wrote out for her a diet for a one-year child and two-year-old child, so that she could begin with a diet somewhere between the two ; the following is what she wrote down :

FOOD FOR THE ONE-YEAR-OLD .

- | | | |
|----|------|---|
| 7 | a.m. | Finely-strained rolong, ragi, or barley con-jee, cooked in milk.
One o'clock warm milk.
A piece of dry toast or an unsweetened biscuit. |
| 9 | a.m. | Fruit-juice : $\frac{1}{2}$ chittack of orange-juice or tomato-juice or guava-juice. |
| 11 | a.m. | A cup of warm milk.
A piece of dry toast or day-old bread or an unsweetened biscuit. |
| 2 | p.m. | Well-boiled and strained rice, with mashed and strained vegetables (as brinjals or |

beans). Mashed potato may be substituted for rice sometimes.

Half a soft-boiled egg, or whole yolk of hard-boiled egg.

A cup of milk.

Half a plantain mashed with milk.

6-30 p.m. A cup of conjee.

A cup of milk.

As the baby was subject to diarrhoea, she began him at once on this simple diet. We have seen that he had been accustomed to getting coffee and curry and sweets from the others, so it was a struggle at first. The older children could not bear to hear him cry and tried to give him things but their mother was very watchful. She was worried because he made such a fuss, but from sheer hunger he began to take what she gave him. When he learned, after a week or two, that crying did not bring him anything, he stopped crying and took what came. But his mother had to keep him in another room while the rest of the family were eating or send him out with the servant, otherwise the smell of their food made him unhappy again.

Since he was several months over a year old, she next began to introduce some foods which were on the list for the second year. The dietitian had given her the following list of foods, asking her to make as varied a choice as possible.

FOOD FOR THE SECOND YEAR

Milk. Six to eight ollocks a day. Some can be drunk and some can be cooked with conjee or custards, or given as curds or whey.

Cereals. Conjee should be given every day. Before the fifteenth month it should be strained and given the

child to drink. Later it may be given as a jelly, and still later as well-cooked whole grains. Grains to be used in making conjee are: wheat, rice, sago, tapioca, barley and ragi. Imported cereals such as Quaker Oats and corn meal can be bought in some shops for variety, if desired.



ON THE HIGHWAY TO HEALTH

Toast, unsweetened biscuits or dry bread may be given, but not more than three slices a day. Well-boiled rice may be given with mashed vegetables or mashed *dal* or curds. Later on, a little very mild pepper-water may be mixed with it.

Vegetables: Must be given once daily. Any of the following: greens, brinjals, lady's fingers, string-beans, dried beans, *dal*, potatoes and other tubers, pumpkin, etc. Where available, fresh peas, carrots, cauliflower and asparagus-tips are also good. Vegetables should be boiled well. Do not drain off the water, for the minerals and vitamins dissolve in it

Meat: Juice or broth may be given two or three times a week if desired. Finely scraped meat only after 18 months.

Eggs: Half of a soft-boiled egg, alternated with meat-broth. At 18 months the whole of a soft-boiled egg may be given.

Fruits and fruit-juices daily: The juice of oranges, pomelos, pineapples, tomatoes, grapes, guavas; tamarind water and mashed plantain; pieces of ripe mango or papaya. Custard-apple without seeds.

Combinations such as custard, milk-toast, itli, appam (the soft, inside part), *payasam* made of vermicelli or sago without nuts or raisins or spices, *pal-kora-kottai*.¹

By the time he was two years old, she was following this general plan:

FOOD FOR THE TWO-YEAR-OLD

- | | | |
|------|------|--|
| 7 | a.m. | One or two cups of milk.
One-third o'clock of cereal cooked as conjee.
One slice dried bread.
One egg (unless it is to be given at 11 a.m.). |
| 9-30 | a.m. | Half an o'clock of fruit-juice. |
| 11 | a.m. | Scraped meat <i>or</i> soft-boiled egg with rice and pepper-water <i>or</i> rice and curds and dal. Well-boiled vermicelli or mashed potato may be substituted sometimes for rice.
Two green vegetables.
A piece of fruit. |
| 3 | p.m. | One or two cups of milk.
One of the 'combinations,' mentioned above. |

¹ Directions for making custard will be found in the Invalid Diet section in Part III.

6 p.m. One or two cups of milk.

One-third o'clock of cereals cooked as con-jee.

One piece of dry toast or one unsweetened biscuit.

At first Mrs. Ranganathan feared that it was going to take a great deal of extra time to prepare special food for the baby, but she was prepared to do it. When she got used to it, however, she found that she could combine this work with her general preparation of food for the family.

How would you manage it in her place?

Now that he was getting fruit-juice and fruit every day and water to drink between meals she found that his bowels moved without any need of castor-oil. She realized the truth of the doctor's explanation that castor-oil formed a bad habit and stopped giving it to the other children except when the doctor prescribed it. She encouraged them to take exercise and drink plenty of water.

The other problem she had to attack was baby Rajah's rest, which the doctor said should be as regular as his food. She was too busy cooking to swing his basket in the middle of the morning, and she needed the help of the servant at that time. Remembering what had been said in the Health Week lectures, she determined to try to train him to go to sleep alone. She made another schedule for him to fit with the food-schedule.

8 to 9-30 a.m. Go out with the servant or one of the brothers.

10-30 a.m. Warm bath.

11-30 a.m. Go to bed.

7 p.m. Go to bed.

After his bath and food, in the morning, she put him in his basket with a toy, patted him a little and then left him. That first day he sat up and howled for an hour, while she went on cooking. At last he fell asleep exhausted, and woke up in a good temper. That night, when he and Sita both were put to bed at seven, he howled again for more than an hour, until finally he fell asleep. It was a long time before he learned to sleep without being swung. He would lie and play with his toys for a time and then drop off to sleep. One very noticeable effect of his changed diet was that he slept through the night, a blessed relief to his parents. Even after Sita was well enough to stay up until eight, he was put to bed alone in the inner room, and went to sleep before the family had their night meal.



WEIGHING BABIES AT 'BABY WELCOME'

Even Grandmother, in the rear, is learning not to fear the 'Evil Eye'!

Encouraged by her success along this line, Mrs. Ranganathan took him to the hospital regularly to weigh him and came home proudly announcing his weekly gains to the family. The doctor said that he was much too heavy for either Sita or the servant-girl to carry, and suggested that he be carried less. Mr. Ranganathan had the carpenter make him some little blocks, two-inch and three-inch cubes fitting in a box. With these and other toys he would sit and play on a mat in a corner, instead of always hanging on his mother when she was trying to work.

‘To think what I have suffered with all my children,’ Mrs. Ranganathan said to Padma, one day, ‘when I could have had an easy time like this! You must train your baby properly from the very beginning, so that you won’t have to go through all this struggle.’

Padma had watched enough of her mother’s difficulties in undoing bad habits to make up her mind that her baby should have no bad habits to undo, but good habits from the beginning. Accordingly, when her little girl was born, she was started right from the first day. Padma was saved much of the needless suffering that her mother had endured because she went to the hospital for her confinement, and stayed there for two weeks after the baby was born. She had a comfortable bed, clean sheets and clean clothing, in a small ward that was bright and airy. Her nurse was clean and intelligent, and knew how to make her feel comfortable. Mrs. Ranganathan watched all the proceedings with amazement and regret.

‘Why did I never come here!’ she exclaimed, a dozen times a day. ‘People told me dreadful things about the hospital. I had that dirty old midwife, who kept me shut up in a dark, stuffy room and refused to bathe me or

give me water to drink for days. If I had come here, perhaps I should not have lost my two precious little ones. Well, well! I am glad you do not have to suffer what I did.'

Since the little girl was fat and healthy, the nurses trained her from the beginning to sleep all night, from ten at night until early in the morning without being fed. They brought her to her mother at regular three-hour intervals. Soon a clock was unnecessary, for the infant woke and cried at exactly the right time. Both mother and baby were bathed every morning. Padma watched the nurse bathing the baby and learned how to do it. The basket was on a table. After each feeding was over, the



SLEEPY-TIME

nurse held the baby over her shoulder until she brought up gas, and then laid her in the basket, covered her

warmly if it was cool, and left her to go to sleep without any further attention. If she woke up and cried before feeding-time, they gave her a little water to drink, changed her diaper if necessary, and left her.

When Padma went home with her treasure, the family wanted to carry the baby all the time, but she was very firm. Sita, she declared, was much too young to hold her baby, and the others were not to touch her when she should be sleeping. She set her basket on a box instead of hanging it from the rafters, so that no one could rock the baby. She tried to follow all that the nurses had done in the hospital. It was hard to resist the pleas of visitors and relatives and her brothers and sisters who wanted to snatch up the baby and kiss it at any hour of the day or night. It was hard for her to resist doing so herself, when she bent over the sleeping darling. But her mother, remembering her own troubles, helped her to be firm.

‘A little pleasure now will only bring ill-health to the child and endless trouble for the mother,’ she explained. ‘Look at how little trouble this baby is, and how well she is.’

As the weeks passed, many friends came in to see this model baby who slept without being rocked or patted, who lay and cooed contentedly in her basket in a shady corner of the veranda, and almost never cried. They were horrified to see Padma eating fruit and curds and pumpkin and other ‘cooling’ foods which are absolutely banned to nursing mothers.

‘You must not eat that!’ they exclaimed. ‘You will give your baby a cold!’

‘My baby has not got a cold,’ she replied, ‘and I eat it everyday.’

‘It’s *your* baby that has a cold,’ added Mrs. Ranganathan, laughingly, looking at the sniffing, coughing child on the critic’s hip. ‘Why don’t you put a flannel jacket or a blanket around him on a damp day like this?’

‘I have no money to buy such things,’ said the woman.

‘Your husband gets more salary than mine,’ retorted Mrs. Ranganathan. ‘I too used to buy gold bangles and leave my babies naked, but my daughter is wiser than I.’

‘Have you had the child branded yet?’ asked an old woman. ‘You had better do it soon, otherwise it will get dysentery and fits.’

Mrs. Ranganathan began to cry. ‘Ah, that was what killed my little one. My mother-in-law had him branded when he was only a week old—they burned him in sixteen places, and I could not do anything.’

Several younger women shook their heads. ‘That’s not right. It’s cruel. We never do that nowadays.’ But the old woman insisted. ‘You had better do it. Remember I warned you. These new-fangled ways are not for us. Now you say you weigh this child every week. You are just calling the evil eye upon her. Believe me, I know what I am saying. Have I not borne twelve?’

‘And only four are living!’ Padma remarked to her mother after the woman had gone.

It was very hard for Mrs. Ranganathan and Padma to stand against all the criticism and the familiar superstitions which their friends constantly preached. When Padma went to visit some relatives with her baby, she was obliged to yield to their wishes for a few days. The break in the routine so upset the baby that she cried and screamed as she never had done before, and her mother had a hard time to get her back into her good habits again. That proved

to her that the new way was right, and she determined to continue, and prove to her friends that they were in the wrong. When her husband took her back to her own home, her baby was the marvel and envy of all her friends. Many a tired, harassed mother with her fretful baby on her hip, came to see the wonder-child who lay and kicked contentedly in her basket while her mother worked, and never woke her at night. Some had the courage to follow her example, for this one example proved more than all the lantern lectures they had attended every Health Week.

CHAPTER V

BABY'S AILMENTS

As there was no hospital in the small town where Padma and her husband lived, she obtained from her mother's Doctor-friend, a set of rules for prevention and treatment of common ailments. These rules she shared with some of her friends, and you may like to share them too.

1. Colds

i. Prevention :

Fresh air, sunlight and well-ventilated rooms are the best prevention. Change the clothing to suit the changes of climate so that the child's body is at an even temperature, neither too hot nor cold. Do not let a draught blow through the room chilling one part of the baby's body. Keep babies dry and keep their feet warm. Do not let anyone who has a cough or cold touch or kiss the baby.

ii. Treatment :

Keep the body at even temperature.

Give the baby plenty of water to drink. If he is breast-fed give it between feedings ; if he is bottle-fed dilute the feeding.

Keep the child's face clean. Burn the cloths with which you wipe his nose.

If he coughs much, give him steam inhalations three or four times a day, that is, let him breathe in the steam from a steaming pot. Add ten drops of eucalyptus to four ollocks of water, if it is available.

If the child is short of breath and has fever, consult the doctor.

Emptying of the bowels is necessary, but the doctor should be consulted as to medicine.

The child should be in the open air but should be warm.

2. Sore Eyes

i. Prevention :

Do not allow a single eye-fly to alight on the baby's eyes. Smear castor-oil around eyes and around lids in the eye-fly season, to keep eye-flies away.

ii. Treatment :

Keep baby's face clean. Wash away dirt from the lids and eye-lashes with clean, boiled water and a small clean square of cloth. Every hour, or as often as pus accumulates in the eyes, wash it out with warm, salt-water, $\frac{1}{2}$ teaspoon of salt to one cup of warm water. Wash the eyes gently with a little cotton or soft cloth, dropping the solution in and then drawing out the pus.

Put castor-oil or vaseline on the lids at night to prevent their sticking together.

It is most important to avoid accumulation of pus in the eyes. It may attack the deeper structures of the eye, and the resulting infection may cause blindness. Consult the doctor about medicine as soon as the trouble begins.

Protect the eyes from bright light. If there is much swelling and pain over the eyes use compresses, i.e., cloths wrung out of cold, boiled water, but do not let them interfere with the drainage from the eyes.

3. 'Indigestion' Diarrhoea and Dysentery

i. Prevention :

Feed baby regularly at stated intervals, following the suggested formula and diet lists. Give nothing between meals except fruit-juice at the stated time, and water.

Boil or scald with boiling water all dishes and utensils used for baby's food, and keep them clean. Keep food covered and do not allow any particles of dust, or flies or other creatures to touch it.

Wash baby's hands and face before and after taking food.

Wash your own hands carefully before feeding baby or preparing his food, and always before picking up an infant in arms.

Do not allow anyone to kiss baby on the mouth, or to fondle and kiss his hands. His hands go directly into his mouth.

These rules apply to all infectious diseases. 'Hand infection' is one of the most common ways of transmitting disease.

Give baby only clean things to play with. Wash playthings often with hot water and soap, and put them in the sun. Do not use pacifiers.

ii. Treatment :

Symptoms of colic and diarrhoea are not alarming in a breast-fed baby if he continues to gain in weight, but the mother should consult a physician about her own diet, and general health. A child who vomits often should always be taken to a doctor. It may mean a serious obstruction at the pyloric end of the stomach.

Many normal infants throw up small amounts of milk immediately after feeding. This means only that the baby has had too much food or that he has swallowed too much air, or his clothing is tight, or he is moved about too much after a feeding. Hold the child up over your shoulder after feeding to enable him to bring up the swallowed air, then lay him in his basket.

If the artificially fed baby has colic or vomits or,

has diarrhœa, consult the physician about changing the formula.

If diarrhœa is severe and especially if blood and mucous are present in the stools, stop all food for from 12 to 24 hours giving only plain boiled water, boiled water containing $\frac{1}{2}$ teaspoon salt to one o'clock water, or $\frac{1}{2}$ teaspoon soda bicarbonate to one o'clock water. The second day give albumen water, barley water, rice water or whey,¹ feeding every three hours, giving water between feedings. *The child must have plenty of water* to make up for that lost in the stools. Gradually increase diet to include thin strained conjees, clear meat-broth (fat having been removed) and carbohydrate soups. Return to milk after symptoms have subsided. Keep the baby's abdomen warm with a flannel binder. Keep the child as quiet as possible. If his buttocks are sore, keep them clean and dry and apply oil or vaseline.

The doctor should be consulted for medicine to be given. Always give the doctor a stool specimen for examination, so that he may advise about the diet.

4. • Burns

Treatment :

Burns heal more rapidly if exposed to open air, but they must be protected from dust and flies. Cover with a paste of soda bicarbonate and clean, boiled water to relieve pain. They may be covered with castor-oil after the pain is eased.

5. Wounds

They must be cleaned thoroughly with warm boiled water and soap. If there is much bleeding pack with clean cloths and apply pressure.

¹ For directions for preparing these foods see Invalid Diet section in Part III.

6. Foreign Bodies

i. In Ear :

In the case of an insect, pour in a few drops of sweet oil, and after insect is dead wash it out carefully with a little warm water.

If the object is a seed or other hard body incline the head and massage in front of the ear. If it does not fall out, consult a doctor. Do not attempt to remove it as you may only force it farther in, and make it very difficult for the doctor to remove it. Do not put water into the ear if the body is a pea or other seed that will swell and become more firmly impacted.

ii. In Nose :

Lubricate passage with sweet oil. If possible, ask child to blow, not too forcibly. If this does not dislodge it, consult the doctor.

iii. In Eye :

Close the eye, refrain from rubbing or winking, and let tears wash the object into the lower part of the eye, where it can be removed with a clean cloth. If the object is fixed, turn the lower lid down or turn upper lid back over a small stick and wipe gently with a clean cloth. If it cannot be dislodged, consult a doctor.

7. Fainting

Put the child down with head lower than feet. Allow free access of air and prevent people from crowding around. Sponge face with cold water.

8. Convulsions

Put the child in a hot bath (not hot enough to injure the skin) or wrap towels wrung out of hot water around it, and apply cold wet cloths to the head. If the lips con-

tinue blue, add one or two tablespoons mustard to a tub of hot water. Hold a folded towel or spoon in child's mouth to prevent biting of the lips or tongue. If possible give the child a hot soap-suds enema—not hot enough to harm.

9. Boils, Abscesses and other Skin Infections

Apply hot fomentations of a saturated solution of Epsom Salts if that is available, or a solution of $\frac{1}{2}$ teaspoon soda bicarbonate to one gill of water, or $\frac{1}{3}$ teaspoon salt to one gill of water.

10. Fevers

Apply a cold compress to the head but avoid too sudden chilling of the body. Give the child plenty of water to drink to assuage thirst and help eliminate toxins. Give the child liquid diet or, in case of a small infant, dilute the feeding with boiled water. Fresh air is essential. Keep the child in bed, as quiet as possible. By all means consult a physician.

PRACTICAL WORK

1. Go to a Baby Welcome one day a week and help to wash, weigh and feed the babies.
2. Attend the Baby Show during Health Week and watch the doctors examine and judge the babies.
3. Make an outfit for a mother who is expecting a baby. This would be an interesting class project.
4. Make a set of posters which you can put up during Health Week to teach the others the facts you have learned about infant mortality, the dangers of impure milk, the danger of pacifiers and other menaces to Baby's life and health.
5. Learn to prepare the following for babies :
Albumen water, ragi-conjee, rolong-conjee, barley-water, barley-conjee, tamarind-water, fruit-juices, strained vegetables, meat broth, vegetable soup, etc.
6. If you have a friend or relative who feeds her baby by bottle, help to prepare the bottle once or twice.
7. Plan a good diet for a nursing mother.
8. Plan a diet for the three-year-old child.

QUESTIONS

1. What are the advantages of owning a cow when there is a baby in the house?
2. Think out the reasons why the following superstitions or customs are wrong:
 - i. Nursing mothers must not eat curds, fruit and other 'cooling' foods.
 - ii. Babies must be born in airless rooms.
 - iii. After confinement the mother cannot be bathed for ten days.
 - iv. After confinement the mother may not have water to drink.
 - v. The new-born baby must be given castor-oil and not put to the breast for three days.
 - vi. Praising the baby, or weighing it, is unlucky.
 - vii. Preparing clothes for the baby beforehand is unlucky.
 - viii. The baby must be kept in a room with windows tightly closed for two or three weeks after birth.
 - ix. Branding the baby will prevent sickness.
3. Why is it bad to muffle a baby's head and neck in heavy woollen things, and leave his stomach and feet bare.
4. Is thumb-sucking a habit to be encouraged or to be prevented? How could it be prevented?
5. How can a child be trained to go to the latrine, instead of dirtying his clothes and dirtying the house?
6. How long should a child wear diapers?
7. How can you help a child to learn to eat congee if he does not like it?

CHAPTER VI

FOUNDATIONS OF CHARACTER

மங்கல மென்ப மனைமாட்சி மற்றத
னன்கல நன்மக்கட் பேறு.

The glory of a house is good children. *Kural.*

அஞ்சிலே வளையாதது ஐம்பதிலே வளையுமா?

As the twig is bent, so the tree will grow. *Proverb.*

Since Padma's husband, Mr. Narashimhan, was a teacher in a Training School, he was very familiar with the principles of Psychology and Child Study. While his wife took special interest in Baby Leela's physical needs and development, he was watching every sign of growing intelligence and personality. He explained to his wife some of the important facts which psychologists can teach parents about their children :

‘ We must not think that babies are simply little animals until they begin to walk and talk. Even while they are in the cradle they absorb impressions which may affect their whole lives. The atmosphere of the home in which they live, and the attitude of their parents have a great effect upon them.’

The young parents tried very hard not to let the baby hear any quarrelling or loud talking. They felt sure that if she grew up in a quiet home where she heard only gentle voices and loving words, it would help her to develop a sweet disposition. As they were a God-fearing couple, they prayed for their child and often the father or mother assumed an attitude of reverence and prayed near the child, so that some of her earliest impressions

might be of reverence and trust, even before she could understand. They were surprised and amused at the strength of will which even so tiny a creature could display. A new servant-woman had disregarded the mother's commands and, in her absence, took up the baby and played with it whenever it cried. Padma tried to show the servant that she must not start this habit, and asked her not to pick her up when she cried. The next time the baby was made ready and laid in bed for her nap, she began to whimper and cry. The servant ran to get her. This time Padma stopped her.

'There is nothing the matter. She is only crying to be noticed and petted. Leave her alone and she will go to sleep. It is time for her to sleep now.'

'But I don't mind holding her,' begged the woman thinking how hard-hearted this strange mother was.

'Of course not, neither do I mind holding her,' said Padma. 'Her father and I are thinking of her future. If we run to pick her up whenever she cries, she will soon learn that she can get anything she wants by crying for it. She will soon control the whole family, and grow up to be troublesome and stubborn. She never used to cry like this till you came and spoiled her. Now she knows very well how to manage you.'

'A tiny baby!' exclaimed the woman, pityingly, as the baby cried more and more loudly.

'"The habit formed in the cradle follows you to the grave!"' quoted Padma. The baby was really angry at being ignored and cried lustily for a long time. Finally she fell asleep. When she awoke and was quiet, her mother picked her up and played with her for a long time and let the servant carry her and talk to her then.

One day, a year later, the father overheard the servant

frightening the child because she would not take her conjee.

‘You be careful!’ she threatened. ‘A devil will come out of that tree and get you!’

The baby was too young to understand the words but she understood the tone, and burst into tears. Her father took her and soothed her and distracted her attention. He spoke very sternly to the servant.

‘If you ever threaten or frighten this child again, I shall dismiss you.’

‘I only said it for fun,’ she insisted.

‘It is not fun. The child understands more than you realize. Never, never, say the word “devil” in this house. I do not want the child to grow up in fear.’

To his wife he explained further: ‘She is just planting the seeds of fear in the child’s mind. They will grow and grow and be a curse to her. Look at me,—educated man that I am! I cannot pass certain trees without fear. I cannot walk in the dark without fear. I sometimes cannot sleep at night for fear if an owl hoots. You are just as bad. Why? Because our mothers and nurses frightened us! Even though we know that it is untrue, still we fear. Let us protect Leela from all fears. We must never show fear in front of her, as she grows older. No matter how much afraid we are, of the dark or the thunder, she must not guess it. She must trust in God.’

When Leela learned to walk, she was never still for a moment. She toddled about the house touching everything, exploring everything. One night when Mr. Narasimhan brought home some of his friends he was surprised to find that the front room, which Padma generally kept very attractive, was looking very bare. After his callers had gone he asked his wife what she

had done with the table-cover and the pictures and brass lamp.

'We cannot leave any of those things out hereafter,' she laughed. 'Baby pulls them all down! You ought to see how funny she is! She takes hold of the table-cloth when I am not looking and pulls and when everything falls she laughs and laughs. She did that three times today, and she broke the vase, so I have put everything away. I cannot leave my scissors or my comb or anything within her reach for a moment.'

'You really mean that you are going to let her force you to spoil the appearance of the house?'

'What else can I do? She is too little to understand.'

Later that evening he thought the matter out and they talked it over.

'It is just an example of the "Law of Satisfaction" which I was teaching my class today,' he explained. 'She pulls the edge of the cloth and a great and pleasing sensation occurs. Everything falls with a crash. Olde people come running, and exclaim and pick things up. She is the cause of it all! She loves the attention and the sense of power. Pulling the table-cloth brought a pleasant result, so she learns to pull it again. Now if you can follow that action with an unpleasant result, she will learn *not* to do it.'

'What can I do?'

'Slap her hands. She's too little to understand a scolding. Look sorry and see if that is enough. If she still does it, then certainly slap her hands. She must learn to obey. Her first lesson will be "Don't touch!" Think what a nuisance it will be when we go to other people's house if she spoils or breaks things.'

'But she is too little to be punished!'

'Don't think of it as punishment, any more than letting

her cry. "As the twig is bent, so the tree will grow." It is just bending the twig in the direction of obedience.'

Padma found that it kept her busy all day to get right habits formed in the baby. One habit was to go to the latrine instead of wetting her clothes and dirtying the house. She took her there frequently to avoid accidents, but when the baby did make a mess, she expressed great disapproval, 'Dirty! Dirty!' If the child warned her as she should, she praised and petted her, 'Clean girl! Good girl!' Another habit was to stop her from putting everything into her mouth. When visitors gave her sweets or cakes as they would do, Leela learned to hold them and look at them as playthings and give them to her mother, without putting them in her mouth. She learned to greet visitors with hands clasped for *namaskaram*.

The baby's hands were so active and restless that her father sought about for inexpensive and educational playthings. He had a shallow and wide box made, and had it filled with clean river sand. Leela loved to play in this with a little bucket and tiny earthen pots. Later a carpenter made her some blocks like Rajan's which she loved to build up and knock down. She learned to put away the blocks in their box when she finished play. One day her father brought her some white clay which he softened with water and kept in a bucket for her. She loved to squeeze it in her hands, and imitate her mother making *palagarams*. In fact she imitated everything constantly, and her father and mother had to be very careful of all their words and actions. When she saw her father writing she tried to get the pencil and scribble in his books. To avoid this, he gave her some chalk and allowed her to scribble on the smooth stone-slab in her play-corner, provided she would scribble nowhere else.

Her mind was opening like a bud. She noticed everything and learned to express herself everyday. Her father taught her little songs with actions, which she sang adorably, but he never let her mother show those off to visitors. 'You will only make her vain and self-conscious,' he protested. 'Don't let her hear you quoting her words and talking about her. The sweetest thing in a child is her lack of self-consciousness. I cannot bear to see children show off.'

Every question that the child asked, the parents tried to answer, though before she was four she was asking many to which they did not know the reply about stars and birds and *poochies* and trains and everything she saw. She begged for stories so constantly that Padma asked her husband to bring her some story-books to read to keep up with the child's requests. When Leela went to bed without a fuss at seven o'clock, her father sat beside her and told her a story before she went to sleep,—never anything to frighten her, but wonderful stories of animals that talked, or children in other lands. She told him everything that she had done and seen during the day, and sometimes made up stories herself, till seven-thirty. If she had been naughty and troublesome during the day, there was no story but a very serious talk, just at sleepy-time when children's minds are especially impressionable. The last thing, they said or sang a prayer together, and she fell asleep feeling happy and confident in the love and care of her earthly parents and her Heavenly Father.

By the time Leela was four, she had a lively little baby brother aged two and a half. He had not had such a good start as Leela, for he had been a bottle-fed baby, and had fallen prey to several childish illnesses. His mother had had a hard time with him, for his illnesses had made him peevish and fretful and much harder to control than Leela.

Even when he got well, he sometimes went into tantrums of anger if he could not have his own way. He had a very hard time learning to obey. It was very good for Leela to learn unselfishness by sharing her toys, but Padma soon realized that the baby was tyrannizing over his sister in a way that was bad for him. Once he insisted upon having a china doll which her uncle had recently sent her. The mother intervened and took the doll away just in time to save it from being smashed. She gave the baby another toy and tried to divert his mind, but he would not be diverted. He flung himself upon his sister and slapped her, and kicked his mother when she tried to lift him, and roared with rage.

‘Here, let him have it!’ said Leela holding out the doll generously, but Padma had no intention of letting her son win a victory by such means. If she yielded now, his bad temper would have a pleasant reward, and he would learn to slap and kick and scream for anything he wanted. She lifted him firmly and carried him into the little inner room where his bed was. He was such a restless baby that they had had to get him a little wooden cot with a strong railing around it, to keep him from falling out. She put him into this cot and said, ‘When Baby is a good boy, Baby can come out and play,’ and left him. A tempest ensued. He screamed and kicked, but all that he gained was to hurt his bare feet on the railing. He roared with anger for an hour,—an endless, dreadful hour for his mother, who went on with her work with a heavy heart. She thought of many naughty, bad-tempered little boys whom she had seen, who slapped and pinched their mothers and annoyed people wherever they went, and doubtless grew up to be troublesome boys in school and bad husbands and fathers. She was determined that her son

should 'learn self-control, and remained firm. When at last the screams died away, she looked into the room and found that the baby had fallen asleep, with tears on his cheeks. She covered him with the sheet and let him sleep. When he awoke, she kissed him and said, 'Are you going to be a good boy now?' 'Good boy', he promised, and she kissed him again and washed his face and took him out for his food, and he was soon playing happily with his sister. Both children learned that when their father or mother once said, 'No', to a request, it was of no use to cry or plead or coax. 'No' really meant 'No'.

Mr. Narasimhan was a man of principle and he was very anxious that his son and daughter should grow up with high standards of truth and integrity. He and his wife decided that the most important thing they could do to bring this about was that they should always speak the truth to their children. They never promised anything or threatened anything unless they really intended to carry it out. One night when he was playing tennis with some friends, he suddenly stopped in the middle of a set and said he had an engagement and must go. No matter how urgently the others pressed him, he insisted upon going, but would not explain his mysterious engagement. A few days later a friend asked again.

'Oh, I had to go,' he explained, 'because I promised my children that I would tell them a story when they went to bed, if they made no trouble when their mother and I went out the night before. I had to keep my promise.'

'What!' exclaimed the friend, incredulously, 'Was that the only reason you left us—to tell your children a story?'

‘ I promised, and I had to keep my promise.’

‘ A promise to a child ! ’

‘ Yes ! A promise to a child ! How can we expect them to trust us, or to tell the truth to us, if we don’t keep faith with them ? ’

The friend only laughed and went off to tell the tale, highly amused at this idea, but his conscience troubled him the next time he made an empty promise to quiet his child.

Leela did not generally tell lies, for her mother did not frighten her into it, but once she did. It was a very sad occasion, not only because her mother washed out her mouth with soapy water (‘ to make it clean after the dirty lie ’) but her father and mother were so grieved at her attempt to deceive them, that she felt thoroughly ashamed.

Another point on which her father was very particular was respect for other people’s property. He gave each of the children a box in which to keep their playthings and other treasures. Neither child was allowed to touch or open the other’s box or take the other’s plaything without asking. On the other hand, they were encouraged to be generous in responding to a request. Similarly, neither child was to touch anything of the father’s or mother’s without permission. In return, the parents were careful not to open the children’s boxes or take their things without asking. Here again, Mr. Narasimhan insisted that the children also had their rights to be respected.

When Leela was three, the Narasimhans had left their house on the main street, near Mr. Narasimhan’s school, and had moved further out of town so that the children might play out-of-doors. It was now a question whether to move back again, so that Leela might easily go to school. They decided against it. Mr. Narasimhan felt that the children’s free play outdoors was better for them than

school at an early age. His own childhood had been ruined by ambitious parents who sent him to school in early childhood and kept him at his books night and day until he had neither health nor desire to go to college. He had no intention of forcing his son or daughter to finish High School at fourteen. He wanted their minds to develop naturally according to their individual bents. When the next June came around, he found a girls' school where there was a kindergarten class, and took Leela there every morning on his way to school. Her mother protested at first :

‘ But that is not the school where the children of the best families go ! I am afraid she will learn bad ways from those children.’

‘ The children of the best families in this town sit on backless benches and gabble the alphabet and the multiplication table under the teacher’s stick, in the old, old fashion ! At the kindergarten there is really a “ child’s garden ”, freedom and songs and handwork and happiness. Leela gets too much attention and fussing over at home. It is time that she mixed with other children and felt herself of less importance ! She won’t learn anything bad as long as she comes home to you.’

At last Padma consented to let the child go every morning into the new and strange world of school, but remembering what had happened to her sister Sita, she sent the servant to bring her home at noon, so that she could get her noon-rest and play outdoors all afternoon, until she was older.

One morning when a friend was sitting with Padma learning to knit, they talked, as mothers always do, about their children.

‘ Why do you bother yourself so much to discipline

them?' asked the other mother. 'Now I just let my children alone, I want them to love their mother. Soon enough they will go to school, and then the teacher will beat them and make them behave. Why should I do anything?'

Padma held up the little sock she was knitting. 'Suppose I start to knit this sock and I do it very badly. I make mistakes and drop stitches until it is ugly and full of holes. Then I give the work to someone else to go on with. However well that person goes on knitting, what will be the result, if the foundation is bad?'

'Oh, the other person can pull out what you did and start over again!'

'That may be possible with wool, but not with minds and characters. "The habit formed in the cradle will follow you to the grave." My husband is a teacher, and he says that teachers can do very little with children unless there is a good foundation to build on. The child who tells lies at home goes on telling lies all his life. The child who is selfish continues to be selfish. It is too late to change them when they go to school.'

'Too late! When they are only six years old?'

'He says that the great men say nowadays that a child's disposition and character are determined before the child is six or seven. Moreover, it stands to reason that a teacher cannot do what a mother can. When I think of the days and weeks that I struggled with my baby to make him control his temper, and how long it takes to teach them good manners and cleanliness and generosity,—how can one teacher possibly do all that for thirty or forty children, along with all the other lessons, and only four or five hours a day? Why, each of those traits has got to be knit into the child's life from the very beginning,—a thread of red here, a

thread, of green there, a thread of yellow there, all the way through. Character cannot be added on like an ornamental border !'

QUESTIONS

1. How can you teach a child good manners ?
2. Mr. Narasimhan spoke of avoiding fears. How do you think he and Padma tried to act in a thunder-storm in order that Leela might not be afraid ? How do you think they prevented her from fear of hooting owls, of the dark, and of devils ? What other fears can you think of that might be prevented ?
3. Is it good to take little children to funerals, or to see any sad or horrible sight ? Why ?
4. How would you use the ' Law of Satisfaction ' to teach a child to be clean and tidy, to speak politely, to be helpful ?
5. What physical conditions may make a child bad-tempered and troublesome ?

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PART III

Sanitation, Health and Home Nursing

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‘ Know ye not that your body is the temple of the Holy Spirit which is in you? Therefore glorify God in your body and in your spirit, which are God’s.

‘ The temple of God is holy, which temple ye are.’

ST. PAUL.

HEALTH CREED of Health Crusaders for India.

My body is the temple of my soul,

Therefore I will strive :

To keep my body clean within and without ;

To breathe pure air and to live in the sunlight ;

To do no act that might endanger the health of others ;

To try to learn and practise the rules of healthful living ;

To work and rest and play at the right time so that my mind
will be strong and my body healthy, and so that I will lead
a useful life and be an honour to my parents, to my friends
and to my country.

(From *Christian Education*)

INTRODUCTION

SANITATION AND HEALTH

Kamala went away to boarding school to complete the last three years of her High School course. The school which she attended tried to train girls particularly in the science of home-making. Each year their Science lessons centred around some practical problems of Health and Sanitation. One year they studied 'Parasites', and she found these lessons so interesting and practical that others may also find profit in them.

PARASITES

Sometimes as you walk through the forest you notice a tree heavily laden with another plant which grows all over it. The second plant sends no roots to the ground to secure food and water for itself but absorbs nourishment from the sap of the tree on which it lives. The tree is obliged, therefore, to support not only itself but the other plant of which it is the unwilling host. Sometimes it fails in the task and is destroyed. A plant or animal which, without securing nourishment for itself, lives temporarily or permanently upon the food of another living organism, is known as a *parasite*. We sometimes use the term 'parasites' in a figurative sense of men or women who, instead of working for their own living, compel others to support them.

We are concerned here chiefly with the various parasites which, at one time or another, use man as their host. These may be divided as follows :

I. Vegetable Parasites.

(a) Fungi.

(b) Bacteria.

II. Animal Parasites.

(a) Protozoa.

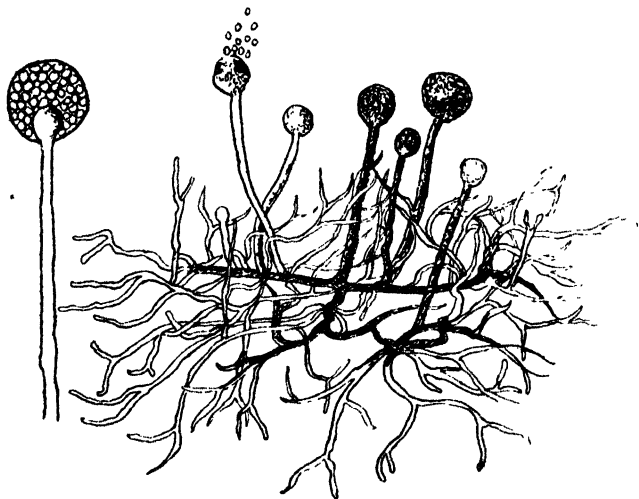
(b) Metazoa.

Of these, all but the metazoa are minute organisms which can be seen only under the lens of a compound microscope. Although only the student of Biology and Bacteriology can study and differentiate between these forms with an accuracy, still it is essential that every person should understand something of their effects upon human health and happiness. Under the heading of 'Bacteria' and 'Protozoa' are included all that vast army of enemies to mankind which we commonly refer to as disease-germs or microbes. If we can understand something of the means and conditions of their growth, we shall know how best to combat them. With the increase of knowledge comes power to prevent and resist the terrible pestilences which were formerly accepted as the scourge of God, but which we now know to be due to these myriads of tiny, invisible foes, whom we can conquer with Cleanliness, Sunlight, Fresh Air, Good Food, and Health in the front-line trenches, backed up by all the artillery of the science of medicine and sanitation.

CHAPTER I

VEGETABLE PARASITES

A. Fungi : We have already studied one form of fungi, namely yeasts, as the friends rather than the foes of man. The same organism has its parasitic forms which are capable of producing diseases such as *thrush*. If the mouth of a new-born baby is not kept clean, sometimes these tiny parasites lodge in the tongue and in the mucous membrane of the baby's mouth, covering it with a white fungus-growth which, when we try to remove it, leaves a bleeding surface.



BREAD MOULDS. (Enlarged)

When you leave damp bread for a time, it becomes covered with moulds. Note the spores.

(From Conn's '*Bacteria, Yeasts and Moulds in the Home*'.)

Similarly *moulds*, which are a harmless fungus outside the body, can produce trouble within the body. Another type of fungus is that which produces the skin-disease known as *ringworm*, which is easily spread by the contact of one person with another.

B. Bacteria : These microscopic plants multiply very rapidly by division, when placed in favourable conditions. They must have nitrogenous (protein) food material, moisture and a suitable temperature, in order to grow. They are classified by shape into an infinite variety of species. We may be content to study them under two large groups :

(1) Saprophytes, or harmless bacteria, which are the friends of man.

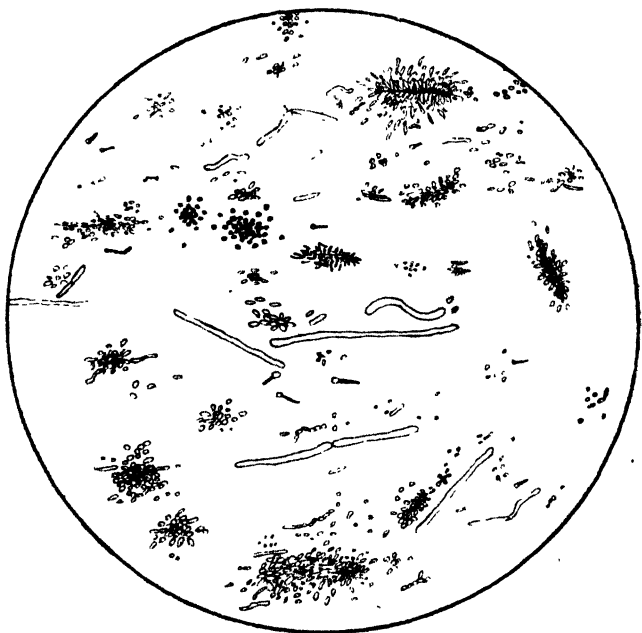
(2) Patho-genic or disease-producing bacteria, which are the foes of man because they feed on living tissues.

BACTERIA AS OUR FRIENDS

The first group, or saprophytes, live on dead and decaying matter. These include the bacteria which bring about the putrefaction of meat and other animal matter, and the decay of vegetable matter. What would happen if every dead creature remained as it is, or if all uneaten food stayed unchanged ? The world would be so full of dead and useless matter that there would be no room for living organisms. When an animal dies, successive armies of bacteria attack the body and work upon it until they decompose it. Any animal body is composed of many elements united together in various chemical compounds.¹ *Decomposition* is the process by which these various elements are released from their compounds and set free to be used again. The mineral elements, for example, sink

¹ See Appendix I.

into the ground to be absorbed later by new plants, while the oxygen returns to the air to be breathed again by animals. Nothing is wasted. We see, therefore, that though putrefaction and decay are repulsive processes, they are really essential to our continued life in the world, therefore we class among man's friends the bacteria that bring this about.



BACTERIA ON PUTREFYING MEAT, AS SEEN THROUGH A MICROSCOPE
(From Conn's '*Bacteria, Yeast and Moulds in the Home*'.)

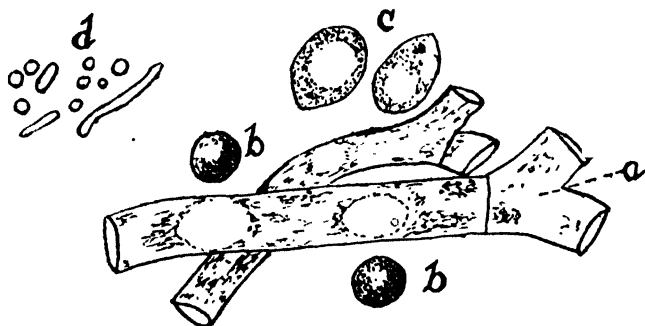
Another type of friendly bacteria curdles milk. Still another type, living in the soil, takes free nitrogen from the air and stores it in the roots of leguminous plants. Pull up a gram or bean plant and find the nodules on the

root where these bacteria live. Since the plant has no power to take nitrogen from the air, it is these bacteria which help to form the vegetable proteins so necessary to our growth.

BACTERIA AS OUR FOES

The harmful bacteria which enter our body as parasites are those which cause the *communicable diseases*, that is, diseases which can be communicated or carried by these micro-organisms from lower animals to man, or from man to man.

Examples of diseases passed from lower animals to man are rabies or hydrophobia, anthrax and tuberculosis.



(a) Moulds ; (b) and (c) Yeast ; (d) Bacteria, highly magnified, showing comparative size.

(From Conn's '*Bacteria, Yeast and Moulds in the Home*'.)

When a mad dog bites another animal or a person, the bacteria of rabies enter the blood of the new host and multiply there, causing the disease. The germs of anthrax pass from horses or cattle to man, through contact. The milk of a tuberculous cow contains bacteria which, when they enter the body of a healthy person, may cause tuberculosis.

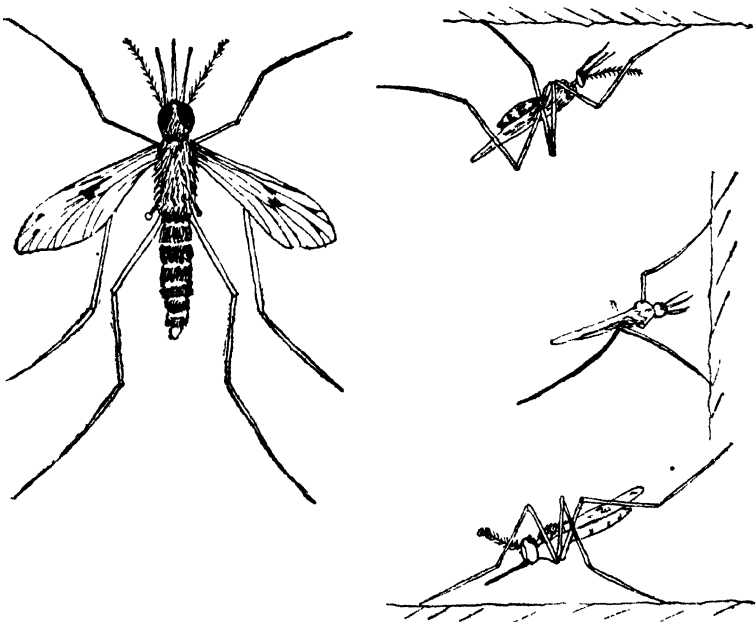
Bacteria pass from man to man in various ways. One way is by water. River or tank water, or water from a poorly constructed well, may have been contaminated by the excretions of persons with intestinal diseases such as typhoid, dysentery, or cholera. The germs of these diseases will be transmitted to the person who drinks that water, unless the bacteria be killed by boiling or by the use of a disinfectant such as potassium permanganate.

Bacteria may be transmitted by a tuberculous mother to her baby, because of the close contact necessary when nursing the child. Milk is also a source of infection when it is mixed with impure water or kept in dirty vessels. If it is only partially heated, not boiled, bacteria will multiply rapidly in it. It may serve, therefore, as a means of transmitting the water-borne diseases.

Certain insects are carriers of bacteria from one person to another. Rat-fleas, leaving plague-stricken rats, carry the germs of plague to those whom they bite. Eye-flies take the germs of sore-eyes (purulent conjunctivitis) from a diseased eye to a healthy eye. House flies carry nearly every disease. Since they lay their eggs on the decaying organic matter in latrines and manure heaps, their larvæ feed on filth, while they carry with them the germs of all intestinal diseases such as diarrhoea, dysentery, typhoid and cholera, which they leave upon our food, our plates and upon our hands and lips if we are not careful. They may carry tuberculosis or diphtheria by lighting upon the sputum of a careless patient, or gather up the germs of leprosy and septicæmia (blood poisoning) by visiting diseased bodies. Flies are dangerous enemies. One variety of mosquito (*Culex Fatigans*) takes into its body the germs of *dengue*-fever when it sucks the blood of a *dengue*-patient, and injects these bacteria into the blood of the

next person whom it bites. When we study Protozoa we shall become familiar with other parasites carried by mosquitoes.

Still other bacteria float in the air. These air-borne bacteria are ejected from the respiratory tract of patients



THE ANOPHELES MOSQUITO (Enlarged)

Showing how it stands at an angle to any surface.

suffering from such diseases as coughs and colds (bronchitis, pharyngitis, laryngitis) tuberculosis, tonsilitis, diphtheria, mumps, measles and whooping-cough. When such patients cough, spit, sneeze or blow their noses, the bacteria are sprayed into the air, floating in small droplets

of moisture, and enter the mouth or nose of a healthy person.

Finally, bacteria may invade the body through a wound in the skin, causing boils and inflammation. In more serious cases poisons may be formed which have a serious effect when absorbed into the blood, as in tetanus (lock-jaw) and septicæmia (blood poisoning). Even the prick of the finest needle or pin is sufficient to give the enemy entrance.

QUESTIONS

1. Make a brief outline in your notebook under the headings 'Bacteria As Our Friends' and 'Bacteria As Our Foes'.
2. Make a list of all the communicable diseases which you have studied thus far, and write opposite each one the way or ways in which it is transmitted.
3. Find out the meanings of the following Latin and Greek words or roots which occur in many scientific names, as a means to remembering what they mean: micro-, para-site, proto-, meta, saritas, putrefy, septi-, -æmia, -itis, patho-, gen-, hydro-, phobia.
4. From what you know of the way in which bacteria are transmitted, how do you think that the nurse can prevent the following from spreading to other members of the family: Typhoid, Dysentery, Cholera, influenza, Dengue, Tuberculosis?
5. Find out from some textbook in Hygiene and Sanitation, the life-history of the fly and mosquito, so that you will know how to prevent or get rid of them.

CHAPTER II

ANIMAL PARASITES

Animal parasites may be divided into two main groups, the microscopic Protozoa and the large Metazoa.

Protozoa: Closely related to the bacteria in their transmission of diseases from man to man, are certain of the micro-organisms of this class known as protozoa. They are the simplest forms of animal-life, consisting either of one cell, like the amœba, or of a small group of cells. These parasites are transmitted in three ways. The germs of syphilis are communicated by direct contact either with the diseased person or with articles which that person has touched. The amœbæ which cause amœbic dysentery, liver abscess and some forms of diarrhœa, reach the healthy person through unclean water or food.

Two different protozoa are carried by the mosquito. The female Anopheles mosquito, if it sucks the blood of a *malaria* patient, takes into its body malaria parasites. These live and develop for a time in the mosquito's stomach, then in the salivary glands, whence they are injected into the next person bitten. You can recognize the Anopheles mosquito from the fact that it stands at a right angle to the surface of your skin,¹ while the Culex mosquito stands with its body parallel to the surface. One type of Culex mosquito is a carrier of the parasite that causes *elephantiasis*, an incurable disease, more common near the coast, called elephant-leg. Another parasite which lives for a part of its life in the body of an insect, is the germ of the dread *sleeping-sickness* which is carried by the tse-tse fly, in Africa.

¹ See page 153.

COUNTER-STRATEGEMS TO FOIL DISEASE

Before passing on to the larger types of animal parasites, we shall consider certain matters common to the transmission of disease by both bacteria and protozoa. As we study the strategems by which these invisible foes enter our bodies, we come to understand the counter-strategems by which we must foil their attacks.

How a Disease Develops

First there is the *infection*, that is, in one of the ways specified above, the germ enters the body. Second comes the *period of incubation*. Just as, when you plant a seed, some time passes before anything seems to happen, so some time passes before the seeds of illness bring about any noticeable effect. This period is called the incubation period, which varies with different diseases, as seen in the table below. Although we are not aware of it, a great battle is taking place in the blood and the tissues of the body during this period. The invading microbes multiply rapidly and produce certain poisonous products known as toxins. They are carried over the whole body. The body defends itself against the enemy in various ways. Certain substances called *antitoxins* are produced which neutralize or render harmless the toxins. The white corpuscles of the blood attack and destroy the microbes. All the natural defences of the body try to prevent the increase of the micro-organisms. If these defences prove stronger than the invading microbes the disease may be prevented or shortened, but if the microbes increase so fast that they overcome all resistance, symptoms of the disease begin to develop.

¹ Period of Incubation of Common Communicable Diseases.

Measles	...	...	8 to 16 days.
Mumps	...	...	14 to 22 days.
Whooping Cough	...	...	4 to 14 days.
Influenza	...	...	1 to 4 days.
Dengue	...	...	3 to 6 days.
Diphtheria	...	...	1 to 6 days.
Typhoid or Enteric	...	...	8 to 14 days.
Cholera	...	...	A few hours to 5 days.
Small-pox	...	...	12 to 15 days.
Chicken-pox	...	...	10 to 21 days.
Relapsing fever	...	...	A few hours to 12 days.
Typhus fever	...	...	6 to 14 days.
Malaria	...	...	1 to 3 weeks.
Plague	...	...	3 to 10 days.
Tuberculosis	...	...	Indefinite.
Syphilis	...	...	6 weeks.
Leprosy	...	...	2 years or more.

If, during the incubation period, the body does not succeed in resisting the disease altogether, the symptoms begin to appear and we say that the person is ill. Different kinds of germs produce different effects, but in general they produce local irritations, destroy tissues, or produce poisonous substances, which give rise to the different symptoms or signs of disease. The body continues its resistance and in time either conquers the disease or is conquered by it.

Susceptibility and Immunity

If a person is not in a condition to resist a certain disease we say that that person is *susceptible* to that disease, --that is, likely to get it if exposed to it. A child whose lungs are weakened by a long attack of whooping-cough is more susceptible to tuberculosis or pneumonia than a child whose lungs are in perfect condition. Any person

¹ For this table, and for much of the data concerning incubation and immunity, we are indebted to McNally's *Sanitary Handbook for India*, pp. 286-90.

who is run down and tired, or whose vitality is lowered in any way, is by reason of such a state, susceptible to any disease to which he may be exposed, whereas a person in good health is not nearly so susceptible. Lowering of the body-temperature below normal, by sudden chilling, renders one susceptible to the germs of a 'cold'; disorder of the digestive processes renders one susceptible to the germs of diarrhoea or dysentery.

By immunity we mean 'that condition of the body which renders it able to ward off successfully the attacks of pathogenic microbes'.¹ Some people do not get a disease even when there is an epidemic of that disease, or if they do get it, they have it mildly. This means that they are wholly or partially *immune* to the disease. Such immunity may be *natural* and unexplained, or it may be *acquired* in one of two ways. One way is by having had the disease. A person who has had smallpox once, for example, is generally immune to smallpox thereafter though not to chicken-pox also, as is sometimes wrongly said. The reason for this is that the antitoxins which were produced during the attack remain in the body and render harmless any germs of that disease which may later find their way in. The antitoxin for one disease will not protect us against the toxin of another.

Artificial Immunity

Another way of acquiring immunity to smallpox is by *vaccination*. The vaccine which the doctor injects into the arm or leg contains the toxins of smallpox, taken from an animal that has the disease. The toxins are in too small a quantity to give the disease, but they are sufficient to stimulate the body to produce antitoxins, which,

¹ McNally's *Sanitary Handbook for India*, p. 289.

after neutralizing the toxins, remain in the body for about five years, ready to attack any smallpox germ which may enter. In a similar way we can be protected against hydrophobia or rabies. In order to protect us against cholera, typhoid or plague the doctors inject into our bodies dead microbes of those diseases, which serve to stimulate the production of antitoxins. Such an injection protects one against plague for six months, against cholera for three or four months, and against typhoid or enteric fever for eighteen months. During an epidemic of diphtheria children are injected with diphtheria antitoxin. As a prevention of diphtheria they can be inoculated with a mixture of toxin and antitoxin which gives them immunity for life against diphtheria.

LOUIS PASTEUR

We stand amazed at these marvellous discoveries that have brought under man's control the deadly pestilences once thought to be God's inescapable punishment. Who found it out? How could it be found out? Hundreds of scientists spend their lives searching with their microscopes to find out the truth about matters concerning which the rest of us blindly guess. One of the men who first discovered the existence of micro-organisms and the part which they play in fermentation, putrefaction and the spread of disease, was a French scientist, Louis Pasteur, who lived from 1822 to 1895. His discovery revolutionized all medical science. Until that time doctors were fighting disease in the dark. Now they came to understand more and more the nature of the foes whom they were resisting. It was Pasteur who demonstrated that hydrophobia could be prevented in the manner described above. Others have followed, showing how to perform operations without

infection and blood-poisoning, how to protect against other diseases, how to recognize each micro-organism, and determine its life-history. Each fact written down in this chapter, which we read and accept so lightly, was discovered at the cost of men's lives. These heroes of science not only spent long years over the microscope, but they suffered sickness and even death as a result of experimenting on themselves in order to prove their theories as to how diseases are transmitted. The cause of some diseases such as cancer, and the cure of others such as elephantiasis are still being eagerly sought. Only recently was the cure for leprosy discovered. These discoveries have saved the lives of untold millions. Further discoveries may help to remove these communicable diseases from the earth. We cannot touch upon these facts without paying reverence to the men and women who, like Kipling's 'Explorer' heard the call :

‘ Something hidden ! Go and find it ! ’
and won as their chief reward the assurance :

‘ Other people might have found it,
But God's whisper came to *me* ! ’

THE PASTEUR INSTITUTES AND KING INSTITUTE

In the Pasteur Institute at Coonoor, and the King Institute at Guindy, scientists continue their researches in the causes of disease. There are prepared the marvellous serums and vaccines which protect the people of our Presidency from disease. If a child has diphtheria, a telegram to Guindy brings the antitoxin by which alone the child's life can be saved. From there go the vaccines which vaccinate all school-children every year, and the plague and cholera serums which help in the fight against epidemics.

At the Pasteur Institute is prepared the serum which prevents thousands every year from a horrible death by rabies, after being bitten by mad dogs. At Guindy skilled bacteriologists examine samples of blood sent from all over the Presidency by doctors who have not the equipment for such examinations, who wait for the bacteriologist's verdict before they can cure the patient. In these and many other ways skilled scientists are serving the people of our land, by lessening the causes of misery and pain.

PREVENTION OF DISEASE

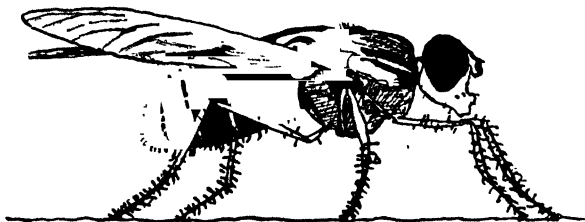
We have studied the ways in which disease germs are carried, and the means used by physicians to produce immunity to certain diseases. There are still other ways by which we can lessen the chances of our being infected.

The body is provided with many means of defending itself against invasion by germs. The saliva and other digestive juices have an antiseptic effect, the liver attacks poisonous substances, and the blood keeps all these defences at the height of efficiency by maintaining good health. Fresh air, exercise, simple nourishing food, rest, recreation and congenial work, regular habits of life—these are our best assets in the resistance of disease.

SANITATION

There are certain factors in our environment, too, which by intelligent effort we can control. Cleanliness of our houses, our kitchens, our drains and latrines, and the public drains and latrines of our towns, will do a great deal. Bacteria flourish in dampness, darkness and dirt. They will find little place to develop in a house which is light, airy, dry, and clean. Our water and milk supply need careful investigation, if we are to avoid the dangers that

a polkited well or a tuberculous cow can bring. In any case we must boil both water and milk to be on the safe side. If we let the kitchen be the darkest, dampest, dirtiest room in the house, if we prepare food with unwashed hands in unclean vessels and leave it exposed to flies, we



OUR ENEMY—THE HOUSE-FLY.

Enlarged to show how it carries dirt on its sticky feet.

are inviting germs to enter. If we let children pick things up off the floor to put into their mouths, or wipe off the baby's nipple on our clothes, we may almost as well inject them with the germs of disease. If we permit children and even grown people to use every public highway as a latrine, and to spit freely in roads and courtyards, how can all the labours of the scientists eliminate the spread of hookworm, typhoid and tuberculosis ?

DISINFECTANTS

A disinfectant is a means by which bacteria are destroyed. Sunlight, fresh air and drying are the best natural disinfectants. Heat is another common measure for killing germs. After cases of cholera, smallpox and plague, the clothing and bedding of the patients have to be burned. When one has a bad cold or influenza, it is wise to burn the cloths with which we wipe away the discharges of nose and throat. In hospitals *steam* is used to sterilize all the

instruments used for operations, as well as the clothing of the surgeons, and all bandages and dressings. If we have to bandage wounds at home, we can use the steam from a pot of water to sterilize the bandages, by leaving them for a long time over the mouth of a pot of boiling water in a sieve or some perforated container with a cover. To kill all micro-organisms, we need to maintain the boiling-point of heat for an hour. Burning sulphur in closed rooms is another means of ridding a house of infection. The sulphur fumes also disinfect the clothing of the patients. As a common means of preventing germs we can use *phenyle* which is sold in a highly concentrated form in bottles. Even a drop or two to a pot of water is sufficient for daily washing of latrines, drains, kitchen-floors, and the floors of eating-verandas to prevent flies and kill germs. When members of the family have itch or sore-eyes, the furniture, doors and pillars of the house need to be washed frequently with phenyle lotion. If phenyle is not obtainable, we can use chunam-water. Another valuable antiseptic is *potassium permanganate* whose crystals are so necessary a precaution in case of poisonous snake-bite. A crystal dissolved in water gives a pink solution in which fruit like grapes, which are eaten with the skin on, or various berries like *jambolams*, can be washed before they are put in the mouth. During cholera or typhoid epidemics wells are disinfected with this.

In addition to these *disinfectants*, by means of which dirty places are cleansed by killing the germs, there are certain drugs called *antiseptics* which prevent the development of micro-organisms. One of the mildest is *boric lotion* with which eyes are washed. A common one is *tincture of iodine* which every family should have at hand to paint on any prick or wound of the skin, to prevent

infection. *Mercurichrome* is a modern substitute for Iodine. *Argyrol* and *Silver Nitrate* are used for infections of eyes, noses and throats. *Lysol* is another useful antiseptic lotion to have on hand for washing itch or other skin infections, or for washing one's hands in after helping a person afflicted with a communicable disease. This or a mild solution of phenyle can be used for disinfecting the clothing and bedding of patients recovering from the less serious diseases such as chicken-pox or itch.

In order to be well armed in the fight against disease, then, the family needs to have on hand :

Soap for personal cleanliness.

Sunlight in large quantities, as well as phenyle for the cleanliness of one's house and surroundings.

In the family medicine cupboard, a bottle of potassium permanganate crystals, tincture of iodine, boric lotion, lysol.

CHAPTER III

METAZOA

The metazoa are parasites which are large enough for us to see with the naked eye. These include fleas, ticks, mites, lice, bed-bugs, which live on the surface of the body, and also the various kinds of worms which live in the alimentary tract. We may take these briefly, one at a time.

Fleas

Fleas are troublesome in some homes, especially where cats and dogs are kept as pets. They have a life-cycle like other insects, laying their eggs on dirty floors or dusty carpets. They become very dangerous during an epidemic of plague, when they leave the dead bodies of plague-ridden rats and carry the plague bacilli to human beings. Dogs which are kept as pets should be washed frequently with 'dog-soap', or with a mixture of hot water and kerosene oil. The smell of the kerosene stupefies the fleas which fall off when the dog is brushed, and can easily be killed. The kerosene should be washed off in soap-suds. Cats hate water but can be sprinkled and rubbed with Keatings' flea-powder which has the same effect of stupefying the fleas so that they fall off and can be burned or killed. Keatings' powder or 'Flit' can be sprinkled about the house, and the bedding well aired. Every effort should be made to rid a house of rats, for they become very dangerous in the time of a plague epidemic. Food should be kept well protected, not left about to tempt rats and ants. Rat-traps or cats are ways in which to get rid of rats.

Ticks

We find ticks chiefly on our domestic-animals, from which they may spread to the members of the family. Dogs and cows suffer terribly from them unless we take pains to pick them off and burn them daily. They have to be picked off by hand. We should not undertake the responsibility of keeping these animals unless we are willing to take time to keep them clean. There is nothing more cruel than to let a dog or cow become covered with ticks which torture it day and night. Moreover, these creatures may carry disease to us. They have been proved to carry relapsing fever. Cows' health is sometimes so much affected by a lot of ticks that they stop giving milk. An infected cowshed should be washed with kerosene emulsion and limewater.

Mites

The mite by which we are most troubled is the 'itch-mite'. This is so small that we cannot see it without a lens. It is like a tiny beetle, the female of which burrows through our skin to the dermis and lays its eggs. Pus is formed through the effort of the white corpuscles to drive out the invader, and a blister becomes visible on the skin. If we prick an opening, squeeze out the pus, and apply tincture of iodine or sulphur-ointment, the mites will be destroyed at once, but if we leave them as they are, new mites will hatch out in large numbers and burrow further through the dermis laying more and more eggs, until the pus-blisters are spread over large parts of the body. These mites get into the clothing and spread to other parts of the body as well as to other people. The only way to get rid of them is

to prick and scrape openings in the skin so that sulphur or iodine may reach the layer of the dermis where the eggs are. We shall learn more of how to treat 'itch' in another chapter.

Lice

Lice cling to the hair of their host and suck his blood. They attach their eggs (called 'nits') to the hair with a sticky substance, and these hatch in five or six days. Sometimes lice live on men's clothing, but generally no their heads. They have been proved to carry the germs of relapsing-fever. The quickest way to get rid of lice in the hair is to wash it in a mixture of kerosene oil and hot water. The nits can be dissolved by rubbing vinegar into the roots of the hair, or picked out one by one. In any case, these parasites should be removed and not allowed to grow and multiply. Lice in the clothes or bedding may be killed by boiling, but it may be necessary to burn them.

Bed-bugs

These are another parasite which cause a great deal of unnecessary suffering and restless sleep. They live during the day in cracks of the walls, floors or furniture and come out at night to suck blood. The eggs hatch in seven to ten days. We can find the hiding places of bugs by noticing a cluster of black specks, where eggs are laid, around a hole or crevice. Such a place should be scraped with cocoanut-fibre dipped in phenyle, and then sprayed with kerosene oil and hot water in a fountain-pen filler. Commercial preparations such as 'Flit' or 'Bohno' are also helpful because the tins come provided with a pump that is useful to spray beams, door lintels and roofs. Once a house

is badly infested with bugs it seems next to impossible to get rid of them without renewing the floors and woodwork. 'Where there is a will there is a way.' A new house can be kept free from them if the occupants make up their minds to it. Some simple rules to follow as a preventive of bugs are :

1. Do not use wooden bedsteads. If you cannot afford an iron cot, use mats and air them in the sun everyday with your bedding.
2. Repair broken furniture and keep it polished and varnished. Clean it frequently with a mixture of cocoanut and kerosene oil. Put it out in the sunshine and examine it carefully once a week. Washing furniture spoils the varnish, but kerosene oil can be squirted into the holes and cracks.
3. If your house has a mud-floor, save up money to put down tiles or stone slabs.
4. Leave no holes in the wall. Stop them up with chunam, and whitewash the walls twice a year.
5. When you return from a journey, examine your clothes, bedding or box and keep them in the sunlight all day.
6. Wash wooden shelves frequently with phenyle solution, and leave them in the sunlight.
7. Consider bugs and all other vermin as your deadly enemies and go to work as soon as you find even *one*. Remember that one can soon become one hundred.

If a room can be closed up tightly, it may help to burn sulphur but in that case you will need to sleep elsewhere for a few days.

Mosquitoes

These have been mentioned as being themselves the part-time hosts of the parasites that cause malaria, dengue, and elephantiasis. When they suck human blood they leave behind them these germs. We must look in shallow pools of standing water to find the breeding-places of mosquitoes. Even pieces of broken pots or empty tins left about, may hold enough water after rain to breed mosquitoes. Where possible, damp and swampy ground should be drained. If we cannot do that, we can pour kerosene oil into stagnant pools near our house, and see that the tubs in our kitchens and latrines are well-drained and refilled, and that no water stands in drains. As the mosquito 'wrigglers' have to come up to the surface to breathe, they die if there is a film of kerosene on the top of the water. If after all these precautions we are still troubled by mosquitoes we should try to use mosquito-nets, as a preventive of disease, until our municipality can be aroused to drain tanks and marshes near the town. When men first started to build the Panama Canal, they died by thousands from fever carried by mosquitoes, and the project was abandoned for many years. Then a host of scientists, engineers and sanitary officers went to the Isthmus and battled against the mosquitoes in the ways above mentioned, until not one was left. Now the Canal is built and the Isthmus of Panama is a healthful place in which to live. When efforts are made in India, millions of sufferers from fever will be relieved.

We come now to parasites which live for part of their life-cycle in the alimentary tract of man.

Hookworms

The hookworm is about half an inch long. It lives in the upper part of the small intestine. Its eggs pass out of the body with the faeces. If the infected person uses the field or the roadside as his latrine, he may leave large numbers of these eggs behind him in the soil where others walk. The eggs hatch into tiny worms, which get into the body through the bare feet of those who walk over them or the hands of those who work in the soil. From the feet they get into the blood-stream and are carried to the heart thence to the lungs, then up the trachea and down the esophagus to the small intestine where they attach themselves and live on the blood of their host. Their numbers increase enormously.

Symptoms

- i. Anemia.
- ii. A tired feeling and lack of energy or ambition.
- iii. Retarding of growth and mental development in children.
- iv. In severe cases, a bloated appearance.

It has been found that 99 per cent of the people of Madras Presidency are infected with hookworm. The Rockefeller Foundation of America is spending millions of dollars in combating hookworm all over the world. Many of us have heard, during Health Week, lectures on this subject illustrated by pictures. At any Government Hospital treatment is given free. One large dose of the medicine rids a person of these parasites. Sometimes the treatment needs to be repeated. If all the people of a community are done, there is less danger of being reinfected. The means of prevention of hookworm are :

- i. Use of latrines, not of fields and public highways.
The prevalence of the disease in India is due to the insanitary habits of the people.
- ii. Safe disposal of night-soil by sweeper.
- iii. Wearing of sandals to protect the feet.
- iv. Annual examination of fæces at a hospital to detect infection.

Round-worms

These are very common. The symptoms are pain in the stomach and sometimes the passing of worms, which look like earthworms. The eggs of these worms get into our bodies through unclean food or water. 2,000 of these were once removed from the intestine of a child. When a person suffers from much pain in the abdomen, it is wise to take a specimen of fæces to be examined at the Hospital. Generally one dose of medicine will get rid of them. As common flies often carry the eggs of round-worm from the latrine, this gives us another reason for combating flies.

Thread-worms

These are smaller and finer than round-worms and live in the large intestines. They are got rid of either by enemas or by medicine, and the infection is passed on as in the case of round-worms.

Tapeworms

The tapeworm lives in two hosts during its life-cycle. When animals eat grass, they may get some of the embryos of one kind into their alimentary tract. The embryo works its way into the muscles and is embedded there in the form of a small bladder worm. If this animal

is used for food, and is not thoroughly cooked, this bladder worm gets into the intestine of the human host, where it grows into a long, flat, segmented worm, with a head that has four suckers and many hooks. Each segment of the worm has both male and female parts and is able to produce eggs, both in and out of the body. As some segments pass out with the fæces, other segments grow in their place. Tapeworms are as long as seven yards. A person may lose thirty or forty yards, with the help of medicines, before being able to get rid of the head. So long as the head and one segment remain, it can keep on growing. An especially bad kind of tapeworm may come to human beings through the proximity of infected dogs. Dogs should not be allowed to lick the hands and face of their masters, for they eat all kinds of flesh and may have the eggs in their mouths.

Symptoms :

- i. Sometimes thinness and loss of weight.
- ii. Great hunger, which seems never satisfied.
- iii. Passing of flat segments in the fæces, or dropping them at other times.
- iv. If it continues for a long time undiscovered, it may cause great debility, and affect many organs of the body.
- v. Sometimes convulsions.

Guinea-worms

This worm is very common in certain districts of the Madras Presidency. The female is a long, thread-like worm which bores its way from the mesentery of the intestine to the surface of the skin of the leg or foot or even back, in search of water. From this hole it sends its

embryos into the water, and they attack and enter the bodies of the *cyclops*, a tiny snail. People are infected by drinking water which contains the cyclops. Prevention is by boiling drinking-water and improving the water-supply.

Reference Book :

For the material used in this section on Metazoa, I am indebted to McNally's *Sanitary Handbook for India*, pp. 255 to 265.

PRACTICAL WORK

1. Make a tabular outline of the Metazoa in your notebook, under the headings, Appearance, Life-history (where known), Symptoms, Cure, Prevention.
2. If you have cows, cats, dogs or poultry at home, examine them for parasites, and carry out the suggestions given.
3. Make a kerosene oil emulsion as follows :
Dissolve three parts of sunlight soap in fifteen parts of water by boiling. Add warm kerosene oil little by little, mixing it well by shaking and stirring.
4. Use your emulsion in water to wash out a hen-house or other place which is infested with vermin.
5. Find a child or children whose heads are full of lice, and get rid of lice and nits.
6. Examine as many of the Metazoa as you can under a hand-lens or microscope. Perhaps you can borrow slides from a hospital or college.
7. Take a walk around the compound looking for stagnant pools or standing water. In each place dip up some of the water in a glass tumbler and hold it to the light to see if you can find either *cyclops* or mosquito-wrigglers. If you do, pour in enough kerosene oil to cover the surface, unless you can drain the pool. Examine water-tubs and drains. Gather up broken pots or empty tins and dispose of them so that they will not hold stagnant water.
8. Make a set of posters to put up in the school during Health Week, to arouse the children to the importance of sanitation. Some topics might be 'Health Habits', 'Rakshasas to Fight', 'Our Enemies, the Flies', etc.
9. Prepare one or two little Health Dramas on Sanitation which could be acted by the younger children in your school or in village schools.

CHAPTER IV

COMMUNICABLE DISEASES¹

I. The 'Children's Diseases'

Certain communicable diseases which are especially common in childhood are called the 'children's diseases'. There used sometimes to be an idea that it was a good thing for children to have these diseases while young and get over with them, since they were bound to get them some day. This dangerous theory led some mothers to let their children associate with or visit children who were ill, and thus catch the disease. Many children have lost their lives through such carelessness, for some of these common illnesses have dangerous after-effects. Some children get the disease much more severely than others. It is especially dangerous for young babies to be exposed to illness.

If mothers and families had what we may call a 'community conscience', they would take such precautions that, even if illness invaded their own household, it would go no further, for they would keep their children and themselves in strict quarantine for the two or three weeks necessary until danger of transmission is gone. This means considerable curtailment of liberty and pleasure, so many families go out and spread the germs to other families. When one person in a family has a communicable disease, that person can show true unselfishness by offering to help

¹ Much of the material used in this chapter is adapted from a pamphlet *Infant Care*, published by the U.S. Department of Labour, and McNally's *Sanitary Handbook for India*, pp. 332-355.

himself as much as possible, and to stay contentedly in a separate room, so that it will not be necessary to run the risk of others' catching it. If he is so ill that he cannot help himself, then one member of the family should undertake the task, and keep separate. Children with whooping-cough or chicken-pox should not be allowed to run about the streets or go into other houses or travel in the train. To do so is utterly selfish and criminal, for while this child may have the disease lightly, he may pass it on to a baby or a delicate child who may die of it. These diseases are spread from person to person, largely by direct contact or by contact with the excretions or secretions from the person suffering with the disease. This means that contagious disease is carried because someone was ignorant or careless enough not to prevent their spread. Parents must realize that they have a duty to the community as well as to the patient.

GENERAL RULES TO PREVENT TRANSMISSION

The germs are spread chiefly through discharges from the patient's nose, throat, mouth, eyes or ears. Keep beside the patient a small earthen pot filled with water in which you have put a drop or two of phenyle, for him to spit into. Keep on hand pieces of old soft cloth, torn into squares, to be used for wiping the nose or eyes and immediately burned. Before sending to the dhoby the towels or clothes or bedding which he used, boil them in soap-suds for ten minutes or soak them in disinfectant solution for six hours. Leave in the patient's room only absolutely necessary furniture, and give him only books or toys which can be burned after he is well. His plate and cup should be kept separate and should be boiled. If he vomits, the vessel or the floor should be disinfected

with phenyle. When the doctor declares him to be out of quarantine, he should be bathed, his hair washed, and clean clothing put on him in an adjoining room, before he goes among others. This does not mean that he should not bathe during the illness. He may be given sponge-baths daily, as in any other illness, provided care is taken, in the eruptive diseases, not to rub the skin hard, and not to let him catch cold. The room where he stayed during the illness must be thoroughly scrubbed with phenyle, aired and white-washed. All the furniture that was in it should be put out in the hot sun and washed with phenyle. The quilts, mattress, sheets or blankets used must be burned, in the case of diphtheria or smallpox, or thoroughly washed and sunned in the case of less serious diseases.

In the case of diphtheria or smallpox, if a patient must be kept in the house with others, a sheet may be hung in the doorway and kept wet with phenyle. In such cases the person who helps the patient must change her saree and jacket when she leaves the room to go among others. She should not eat in the sick-room, and she should wash her hands after touching the patient.

In all cases of communicable disease, the doctor or health officer must be notified.

WHOOPING COUGH

(Tamil : *kakku-van* ; Telugu : *kukka-dugau*)

Symptoms

Cough without fever for about two weeks. The spells of coughing become more severe, sometimes followed by vomiting. Finally one hears the characteristic 'whoop' or long-drawn, whooping intake of breath between two series of short, explosive coughs. Paroxysms of whooping and coughing are followed by vomiting.

Treatment

The child should be under a doctor's care and observation. Unless he has fever he does not need to stay abed, but should not exercise or exert himself too violently. As he vomits frequently, he needs frequent feeding of nourishing and easily digested food. He should stay out of doors as much as possible, unless it is damp or rainy, and should sleep in a well-ventilated room. When he begins to have a paroxysm of coughing he should, if at home, run to his own special pot and spit or vomit into that so that it can be disinfected. He should be carefully bathed with warm water in a closed bathroom every day; his clothing should be changed and washed frequently. He can give the disease for six weeks after infection, and the cough may continue much longer. He must be kept away from other children.

Possible After-effects

Whooping-cough is dangerous to babies, and they should be protected from it in every way possible. A strong child may not suffer after-effects, whereas a more delicate child may have his lungs weakened so that he is easily susceptible to pneumonia or tuberculosis. In any case a child should have a long period of convalescence, and should not be sent back to school until entirely well and strong again.

The ' Poxes ' (Vern. *Ammai*)

SMALLPOX

(Tamil: *Periya Ammai*; Telugu: *Pedda Amma*)

This is the most serious of these eruptive diseases. It could be abolished from our land if every one were properly vaccinated, for it is the only 'pox' against which

protective vaccination is possible. The death-rate from smallpox in the Madras Presidency is 0.6 per thousand of the population, in spite of efforts to vaccinate large numbers. Babies should be vaccinated during the first year, as early as possible, and every seven years thereafter. At the time of an epidemic it is safest to be re-vaccinated.

Symptoms

High fever, and then an eruption which begins as papules or pimples on the wrist. The eruption spreads and the body is covered with pustules, which contain pus. The patient is much more ill and more prostrated than by chicken-pox. The uncovered parts of the body are more intensely affected in smallpox and the covered areas in chicken-pox.

Treatment

The physician and health officer must be notified at once, and the patient should be moved to an isolation ward at the hospital. The house should be disinfected, according to the health officer's orders, and every member of the family vaccinated. The family should obey orders strictly, remembering that their convenience counts for nothing in comparison to the safety of the community.

Possible After-effects

Those who have been protected by vaccination get it lightly. Others run the risk of its proving fatal, or of its leaving permanent disfigurement, blindness and deafness.

CHICKEN-POX

(Tamil: *Chinna Ammai*; Telugu: *Chinna Amma*)

Symptoms

This also begins with papules or small pimples which develop into vesicles or blisters and spread over the whole body.* The child may or may not have fever.

Treatment

The doctor should be notified and his advice followed. The child should be kept in bed for three days on light diet, and longer if he has fever. He must not scratch the vesicles for they will become infected. If they itch a great deal, dissolve some soda bicarbonate in water and sponge them with that, or soften the crust with oil. The child may be carefully bathed with warm water everyday, and clothing should be frequently changed and boiled. He should be isolated as long as the crusts are present.

After-effects

This is the lightest and least serious of the eruptive diseases. Nephritis may come on in even in a mild case either during the period of eruption or afterwards.

MEASLES

(Tamil: *Thut-Ammal* or *flat-pox* ; Telugu: *Thut-Anma*)

Symptoms

About 14 days after exposure the child gets symptoms of a cold,—running eyes and nose, cough, and fever which may be high. An eruption appears on the inside of the mouth and on the face. It is not like the discrete raised pimples of chicken-pox, but appears first as small dark-red spots, not elevated, some of which later become papules. Where the rash is intense they are often coalescent, while others are separated by normal skin, giving a mottled appearance.

Treatment

The child should be under a doctor's care, and should be isolated from others. He should stay in bed for a week

or more if fever continues longer, and must not catch cold. The room should be well ventilated, but no draught should blow on the child. If his eyes are sensitive they should be protected from the light by a screen between him and the window. He should have old, soft cloths to wipe his eyes and nose and ears, and these should be burned. He may be given a sponge-bath in bed everyday, and clothing should be changed and boiled.

After-effects

Some children suffer very much from measles and are so weakened by it that they are susceptible to pneumonia or tuberculosis, or their hearts are weakened. Some suffer from acute conjunctivities. Blindness or deafness may result. Others get the disease very lightly and suffer no after-effects. The child should have a long convalescence and be entirely well and strong before being sent back to school.

DIPHTHERIA

—This disease is most common in children between the ages of 18 months and 5 years. It is one of the most serious diseases and can be cured by prompt injection of diphtheria antitoxin. The germs, like the germs of typhoid, may be carried by a third person who is himself healthy, called a 'carrier', or may be carried by milk, or by flies, or by droplets in the air, from the diseased person's nose and throat discharges.

Symptoms

It begins two days after exposure, and most commonly affects the nose and throat. Grey patches on the tonsils, soft palate or the sides of the throat suggest diphtheria.

A membrane may grow across the back of the throat. Swallowing is painful and difficult. The glands of the neck become swollen. If it is nasal diphtheria there may be a bloody discharge from the nose. The child has only slight fever and may not at first appear very ill.

Treatment

A little child's or baby's sore-throat should always be shown to a doctor. If the doctor suspects diphtheria he will begin to give injections of antitoxin which will cure the disease, but delay in giving antitoxin may be fatal. The utmost care is needed to prevent the spread of the disease to others in the family or community. The patient has to be kept in bed for three or four weeks, and must be isolated until microscopic examination shows no more germs in cultures from the nose and throat.

After-effects

This disease affects the child's heart, which has to be watched with care for many weeks. It may cause paralysis of different muscles, commonly those of the forearm, resulting in 'wrist drop'.

INFANTILE PARALYSIS

The effects of this disease may result in deformity throughout life.

Symptoms

Not very definite symptoms at first. There may be fever, vomiting, constipation or diarrhoea, general weakness, prostration, irritability, drowsiness, headache and nervous symptoms. Often muscular weakness or paralysis in the neck, back, hands or feet is the first symptom noticed. The child complains of pain on being moved and

sits or stands with difficulty. This may not appear till the third or fourth day or even later.

Treatment

The child will have to stay in bed three or four weeks, and must be under medical care. He must be in quarantine for four weeks.

After-effects

The legs or arms may be deformed, through loss of muscle-power, throughout life. Immediately after recovering from the disease, if a child can attend a hospital regularly for two years, much may be done by massage and special exercises, to re-establish muscular control.

II. Other Communicable Diseases

CHOLERA

This disease causes more deaths than smallpox. It is carried by human intercourse, by food, by milk, by flies, and by 'carriers' who carry the germs in their bodies long after recovery. Epidemics occur in many parts of the Presidency between June and September every year.

Symptoms

The seizure is very sudden. Pain in the abdomen, vomiting and 'rice-water motions'. Cramping muscular pains in leg and throughout body. The drying of the plasma of the blood causes quick collapse.

Treatment

Medical aid must be summoned at once. Saline infusions, that is, pouring into the veins of salt-solution to take the place of the plasma, will save life. The patient should be removed to an isolation ward.

Those exposed to the disease should be inoculated with anti-cholera vaccine. Wells and other sources of drinking-water should be disinfected with potassium permanganate. The discharges vomited or passed out through the intestines are full of the bacilli. These discharges should be mixed with strong phenyle and boiled before being buried, or mixed with saw-dust and burned. If those who help the patient are careful to wash their hands in disinfectant after each contact with the discharges of the patient they may avoid infection. All clothing and bedding must be burned. Once a careless family spread cholera to a whole town by giving the clothes and bedding to a dhoby who washed them in the river where all got their water.

After-effects

Great weakness.

PLAGUE

Bubonic plague is, as we have seen, carried by rat-fleas from plague-stricken rats.

Symptoms

Swelling of a group of lymph-glands under the arms or elsewhere. Headache, aching of limbs, great thirst, high fever, prostration, sometimes a rash.

Treatment

Medical aid must be summoned at once. The patient must be moved to the isolation-hospital and the house evacuated, to prevent other members of the family and the neighbours from the danger of infection. Some families are so unwilling to leave their houses that they hide the fact that one of them has the disease. This is criminal selfishness. Inoculation by anti-plague serum and the killing of rats are the chief ways to avoid getting the disease.

TUBERCULOSIS

This disease is sometimes called the 'white plague'. It is a very dangerous and subtle pestilence because it attacks a person so gradually that he is not aware of it until it is well advanced. It is increasing in India. The bacillus of this disease gets into the body generally through the inhalation of air containing the dust of dried sputum. The commonest kind of tuberculosis is that of the lungs, or phthisis, but there is also tuberculosis of the intestines, of the joints and other varieties.

Symptoms

Continued loss of weight, especially in children who ought to be growing; persistent cough; recurring colds; pain in chest, fatigue, and low temperature every evening are some of the symptoms which may lead one to go to a doctor for examination of the lungs and of sputum.

Treatment

If the disease can be detected before it has advanced very far, rest, fresh air and nourishing food will effect a certain cure. The patient should apply for admission to a Sanatorium, such as the one at Arogyavaram in Chittoor District, where he may live out-doors under ideal conditions for several months. In such a Sanatorium he lives a carefully regulated life of alternating rest and exercise, with nourishing food and constant medical supervision. Under these conditions, the diseased lung-tissues or other tissues gradually heal without need of other medicine than sunlight and fresh air. If a patient is at home, he should lie on the veranda in all weathers, never breathing the stuffy air of a room, and should be under constant medical supervision. The utmost care will be needed to avoid his

passing on the disease to the family. He must spit only into a pot of disinfectant, he must cover his mouth when he coughs, his handkerchiefs must be burned, he must eat tissue-building foods such as milk, raw eggs, wheat and ragi, and live a very quiet life.

After-effects

Patients may be entirely cured, if the disease is taken in time, or it may be arrested and will remain inactive only as long as the patient takes good care of his health.

Prevention

The constant spitting on roads and in courtyards, is doubtless one of the chief causes for the spread of this disease, as is the practice of sleeping in unventilated rooms and eating of insufficient food. Greater attention to sanitation and personal hygiene, the weighing and frequent medical examination of school-children are ways in which this 'White Plague' may be combated.

DYSENTERY (Bacillary)

This disease is contracted by contact with excreta of patients, or may be carried by contaminated food, milk, water or flies.

Symptoms

Pain in abdomen ; frequent motions containing blood and mucons ; fever ; prostration.

Treatment

The patient should go to bed and have medical advice. The doctor will determine what the diet should be. In severe cases an intravenous injection of serum may be given.

INFLUENZA

Symptoms

Fever, cough, running of the eyes and nose; pain in the back and muscles; constipation: restlessness and irritability.

Treatment

Rest in bed and liquid diet until fever has gone down. A cathartic should be given to open the bowels. This disease is transmitted through discharges from the nose and throat, so the patient should spit in a pot of phenyle, cover his face when he coughs, and wipe his nose and eyes with old cloths which should be burned.

Complications

Hemorrhage, especially from nose, pneumonia or weakness of the heart may occur, so that medical care is necessary.

DENGUE-FEVER

This fever is carried by mosquitoes.

Symptoms

Fever with pains in the back and all over the body. Generally there is fever for four days, then no fever for four days, then fever recurs. Sometimes it recurs a second time. Sometimes a rash appears.

Treatment

The patient should go to bed under a mosquito-net to protect other members of the family from infection. Light diet.

After-effects

Great weakness. Sometimes pains persist in joints and muscles for many months.

MALARIA

This fever is also carried by mosquitoes.

Symptoms

Chills and fever, recurring every third day.

Treatment

Take a dose of Epsom Salts to empty the bowels. Stay in bed on a light diet until fever stops recurring. For adults, five grains of quinine four times a day, and for children half this dose, may check the disease. Quinine may be bought at the Post Office. As this may not be sufficient treatment, medical advice is necessary.

After-effects

As the malaria parasites destroy red corpuscles, continued malaria causes anæmia.

TYPHOID OR ENTERIC

You will read a description of this in the following chapters.

III. The Venereal or 'Social' Diseases**SYPHILIS**

There are two kinds of syphilis—congenital syphilis which is present from birth, and acquired syphilis which is caught like any other communicable disease by contact with an infected patient or objects touched by a patient who is in an infectious stage. Congenital syphilis is found in the children of syphilitic parents and is frequently the cause of miscarriages and still-births.

Symptoms

- i. Congenital syphilis : Enlarged liver and spleen, infection of cornea, the 'snuffles' (running of the nose) malnutrition and imperfect development.
- ii. Acquired syphilis :
First stage : Single large sore.
Second stage : There may be fever, general malaise and body pains, general eruption over the body, localized sores.
Third stage : May be twenty years after infection. Any organ or tissue of the body may be affected resulting in horrible sores, deformities, disabilities or insanity.

Treatment

It can be cured if the patient has treatment for one to three years. Blood tests are taken from time to time.

GONORRHOEA

This disease is caught by personal contact with diseased persons.

Symptoms

Profuse foul discharge from the vagina ; pain or burning on urination ; pain in joints or back ; may be fever in acute case. In most cases the organs of reproduction are so badly damaged that the patient is a chronic invalid. Women with this disease may be rendered sterile, i.e., they cannot bear children.

Treatment

It is very difficult to cure. Long-continued, regular treatment is necessary.

These venereal diseases are spread largely through impurity, and illustrate the statement that 'the sins of the fathers are visited upon the children unto the third and fourth generation'. Countless innocent children suffer and die, countless mothers lose their children, and countless other innocent people catch these dreadful diseases, because of those who sin. In some countries legislation is being pushed to require that a couple should have a physical examination before being permitted to marry, so that the innocent may be protected. As all sorts of people use railway-trains and waiting-rooms and public latrines, one should be careful not to touch dirty things and put the hands in the mouth.

CHAPTER V

KAMALA BECOMES A HOME NURSE

How it Happened

One summer there was an epidemic of typhoid fever or enteric in the Ranganathans' town. The hospital was full, with patients lying even on the verandas. When Sundaresan came down with fever, his parents were very much worried and called their Doctor-Friend. She said that he might very likely be getting the prevailing illness.

'One more victim of this municipality's frightful drains!' she added. 'Perhaps they will learn a lesson now and spend a little more money on water-supply and sewage-disposal and Health Education. Of course there will be epidemics as long as every street is bordered by filth and stench. We shall have cholera next. But what are we to do with this little man? We haven't a corner left in the hospital and three of our nurses are down with it.'

'Oh mother, let me be his nurse!' begged Kamala. 'I've learned all about Home Nursing at school.'

Mrs. Ranganathan was too distracted to notice.

'Home Nursing, eh?' inquired the doctor gruffly. 'I've never believed in it. It only makes children or silly women think that they know everything and don't need the doctor. Now I spent eight hard years learning to be a doctor, and I know people who spend three or more hard years learning to be nurses. We know there are no short-cuts or 'royal roads' to a knowledge of the human body. I suppose you think that you learned it all in three weeks?'

'Oh no, doctor,' replied Kamala, somewhat abashed.

'I don't know anything. We only learned how to co-öperate with the doctor. If you'll tell me what to do for Brother, I'll do just what you say.'

'Well, show me your notebook, then,' conceded the doctor, 'there seems to be nothing else to do, Amma, but to keep the boy here. Of course this may be only a light fever, and then again it may be a long illness. Can you send the other children away? They had better go. But keep Kamala. She can help you, and keep you from over-working, especially if your husband has to work all day. Ah! Is this the notebook? Hm!' she looked through it casually. 'Not so bad. "In choosing a room for the sick, choose the best one in the house." You can do that, and go on with the preparations. Can you take temperature? Good! Now, Mr. Ranganathan, have you all been inoculated? No? Well, you stay with the boy, and let your wife and the children come now. I will do them first and you later. The older boy can take them off to Padma's or to other relatives to-morrow, and they'll have to have the second inoculation there. Kamala, I'll lend you a thermometer from the hospital, and you can begin at once to keep a chart, to show me everyday. Don't let the boy sit up or walk or eat anything except what I've told you, and Kamala, you do what your notebook says about disinfecting discharges. I see you're going to be a real help in this emergency. I wish more families had home nurses all ready to use!'

She bustled out, and the others followed.

The Sick-room

When Kamala returned with a brand-new thermometer she was too much excited to remember her aching arm. She took Sundaresan's temperature, and washed the

thermometer in the dilute carbolic lotion the doctor had supplied, wrote down the record, and then began to read over her notes on directions for preparing the sick-room. Sundaresan was lying on his mat on the floor of a dark, inner room.

‘We must put him upon a bed,’ she declared, ‘otherwise it will be very hard to keep him clean without moving him, and we must find a lighter, airier place. He will be dreadfully hot in there.’

They finally decided that Mr. Ranganathan’s little office would be the best place, for it had two windows to let in sunshine and air, it was away from the smoke of the kitchen, and more private than the courtyard-veranda. They took out all Mr. Ranganathan’s things and his almira, and put them in another room, and gave the room a thorough cleaning from top to bottom, ending by sprinkling phenyle. When this was dry, they brought in a taped cot which had been standing on end, unused, for a year. A carpenter mended the broken leg, they re-taped it more firmly, and laid a quilt on it to serve as mattress. Later on they made a mattress of dungary stuffed with cotton on one side and cocoanut-fibre on the other which they turned for a change from softness to coolness when the boy was tired. Mrs. Ranganathan found two clean, white, twill sheets, and tore up an old white saree to make a draw-sheet. They sent out to the shop for a yard of oilcloth to protect the bed. Kamala read over her directions for making the bed, and then did accordingly, while her mother was preparing the nourishment which the doctor had advised.



MAKING A SQUARE CORNER

so that the sheet will lie flat and smooth when tucked in.

DIRECTIONS FOR MAKING THE BED

Cover the mattress with a sheet having the centre-fold of the sheet in the centre of the mattress.

1. Tuck in the sheet at the top of the mattress.
2. Tuck in one side making envelope-corner at the top.
3. Go to the other side of the bed and draw the sheet tightly across the mattress. Tuck in evenly and fold top corners like an envelope, as on the other side.
4. Lastly tuck in bottom portion and fold corners like envelope neatly and smoothly.
5. Now place rubber sheet or oilcloth in the centre of the bed.
6. Cover this with the small draw-sheet. Tuck in the draw-sheet across the middle of the bed so that it is tight and smooth.
7. Next place the upper sheet on the bed, bringing the upper edge to the top of the mattress.
8. Tuck it in at the bottom only, folding corners like an envelope.
9. Arrange the blanket like the top sheet, but have the upper edge of the blanket six inches below the upper edge of the sheet. Turn the sheet down over the blanket to protect the top of it.

EXPLANATIONS

The upper sheet protects the blanket, just as the lower sheet protects the mattress. Blankets are more expensive to buy and much less easily washed than sheets. By careful management on the part of the home nurse a blanket will not become soiled.

The oilcloth or rubber sheet protects the mattress from getting wet or soiled during illness. The oilcloth is not comfortable to lie on, so the draw-sheet covers it. It is called a 'draw-sheet' because it can be easily drawn from one side of the bed to the other, providing a clean, cool spot for the patient to lie on. It can also be easily changed without much disturbance to the patient.

Kamala found that the pillow looked dirty on the clean bed after it was made, so she hastily stitched a fresh pillow-slip, and determined to make several more to keep on hand, as well as a new pillow stuffed with cotton. When everything was ready she called her father and brother who helped to put a clean shirt on the boy and carried him to his cool, white bed, where he sank back with a sigh of comfort.

When the doctor made her next visit, she found the patient comfortably settled in his little 'ward'. A chair was drawn up between the bed and window and covered with a mat, to keep off draughts. There was nothing else in the room except a stool on which Kamala had arranged the patient's special plate and cup.

'This looks like a real hospital ward!' exclaimed the doctor. 'You are lucky to have a bed and sheets, Sundaresan. I have just been visiting another sick boy who was on the floor, and his mother was breaking her back bending over him. I found two benches in the house and we put them together with a mat on top and lifted him up on that to make it easier for his mother. But a bed is much more comfortable. This is a nice airy room, but I fear it may be too near the street. However, I see it is the best you have. That's right, keep his cup and plate here, and don't let anyone else use them. Scald them out with boiling water every time you wash them.'

'Now, Mrs. Ranganathan,' she added, after they had left the patient's room and were out of hearing, 'I think it probably is typhoid, but he is strong and he ought to come out of it well. Everything depends on the nursing. You and Kamala must take turns. I advise that you stay with him at night and let her do most of the work in the day-time. Your husband will help. You must keep your health so that you can resist the disease. You must both go out to walk every afternoon, and leave your husband in charge. Kamala must sleep all night, and you must sleep in the day-time. There is nothing to be gained by falling ill. Kamala, have you learned to give a sponge-bath? Good. I want to see how you do it. Heat up some water and get things ready. I will go down the street to another patient and come back.'

Kamala studied her notes while the water heated.

CHAPTER VI

KEEPING THE PATIENT CLEAN

'Many people think that baths are harmful to sick people. It would indeed be harmful to make a sick person take the usual sort of bath, being rubbed with oil and then washed with soap-nuts, with quantities of hot and cold water poured over him. That would tax a sick person's strength beyond endurance. But by less vigorous methods a person may be given a bath which will make the skin clean and thus enable it to perform the function of elimination so necessary both in health and disease. Moreover, a patient will feel more comfortable if he has a daily bath while bedridden.

A bath given to a person in bed is called a sponge-bath or blanket-bath. To give a sponge-bath the following articles will be necessary :

A basin, a vessel containing hot water, soap, two towels, wash-cloth, a blanket.

Proceed as follows :

Place a blanket under the patient, turning him to one side while you roll it half way, and then turning him back and pulling it out on the other side. This will protect the bed and prevent chilling if the weather is cold. Remove patient's clothing. Cover him with a sheet or blanket according to the season of the year. Wash his face first and wipe it dry. Next wash hands and arms. Then chest and abdomen. Turn patient on his side and wash his back and buttocks. Then turn him on his back again. Have him bend his knees. Place a towel or thick newspaper under his feet. Place the basin of warm water on this and allow the patient to put his feet in the basin of water. Wash legs and feet in this way. Remove basin and wipe feet dry. Wash the private parts last.

Before you begin, have everything ready by the bedside. Do not tire the patient by beginning the bath and then running away for some articles you have neglected to bring. Expose only the part that is being bathed, and carefully wipe it dry after washing it, before proceeding to the next part. When a blanket is not available to place under the patient, the bed may be protected by placing a towel under the part that is being bathed.

THE PURPOSE OF BATHING THE SICK

1. To cleanse the skin.

The skin is an organ of elimination, and if the pores are clogged with dust or oil it cannot perform this function. It is, therefore, very necessary that the skin should be thoroughly clean, especially during disease. Illness is caused by poisonous substances which have



BATHING THE PATIENT IN BED

gained entrance into the body, and the sooner these are got rid of, the sooner will there be a return to health. The home nurse should consider the cleansing bath part of the daily routine of caring for the patient.

2 To reduce temperature :

When there is constant high temperature the doctor will order a cold sponge, that is a sponge-bath given with cold water. If carefully given this will soothe the patient and bring down her temperature. It should be given as follows :

Have ready before you begin a vessel containing cold water, a wash-cloth for sponging and a larger towel to protect the bed. Place the large towel under the part that is to be sponged. Wring out the wash-cloth, not too dry, and sponge the parts in the following order : face, hands and arms, chest, abdomen, legs, and last of all, back. Use long strokes in sponging and apply gentle friction. Pressure or friction on the abdomen must be avoided. You need not wipe the patient dry as excessive temperature will cause rapid evaporation of the water. During the bath keep the patient covered with a sheet, and only expose the part that is being sponged. Rubbing the back with methylated spirits or cocoanut oil after the bath will add to the patient's comfort, while materially aiding the soothing

effect of the bath. The patient should be covered with a sheet or blanket after the bath, depending on the season of the year and climate. Her temperature should be taken and recorded half an hour after the bath has been given.

3. As a sedative, for its quieting effect :

A warm bath, not hot, has a very soothing effect on nervous and restless patients.

4. To stimulate the circulation :

Either a cold or very hot bath will stimulate the circulation.

5. Medicated baths for special purposes.

These are given for skin-diseases, or a *mustard* bath is given to a small child who has a sudden convulsion. A tablespoonful (about $\frac{1}{2}$ chittack) of mustard to a basin of hot water is used. The mustard powder should first be mixed in cold water and then added to the hot water.

CARE OF THE PATIENT'S HAIR

A patient's hair should be combed daily. It will not hurt her brain as some people think. Part the hair in the middle of the head from front to back. Comb to either side and arrange in two plaits or braids. If it is much tangled, grasp the hair firmly near the roots and brush it gently. Comb it first from the ends, working up. If it tires the patient to untangle it all at once, do a little each day. It is a disgrace for a nurse to have a patient with matted hair.

By the time Kamala had studied these notes a nurse from the hospital came in to help her, as the doctor was busy. She brought from the doctor a bottle of Lysol solution and a brush, requesting that Kamala and her mother put a little of the solution in hot water and scrub their hands well after helping the patient, many times a day. With the nurse's help, Kamala and her mother gave the boy a cleansing-bath and an oil-rub. As they were new at it, they spilled water and it became necessary to change the under-sheet. The doctor had forbidden the patient to sit up. Mrs. Ranganathan brought a clean white *vaishti* in place of a sheet, and the nurse showed them how to change the sheet without moving the patient off the bed.



CHANGING THE UNDER-SHEET

DIRECTIONS FOR CHANGING A BED WITH THE PATIENT IN IT

1. Loosen all the bed-clothing and remove all but one pillow.
2. Turn the patient to the side of the bed, keeping blanket or sheet over her.
3. Roll the under-sheet and the draw-sheet from the side furthest from the patient to the middle of the bed.
4. Place the clean sheet, half of which has been rolled lengthwise, on the bed. Tuck in on one side, and place rolled portion close to patient's back.
5. Place the draw-sheet over this, rolling half of it close to the patient's back.
6. Now turn patient over to the clean sheet.
7. Remove soiled sheets and tuck in clean one on opposite side.
8. Cover the patient with the clean upper sheet. Have her hold the upper edge firmly with both hands and gently slip the soiled sheet or blanket from under the clean sheet without exposing the patient.
9. Finish the bed by tucking in lower part of sheet and folding corners neatly. Adjust blanket in same manner as before.

When this was all over, Sundaresan, who had spent a very restless hot night, drank his broth and dropped off into restful, comfortable sleep. Mrs. Ranganathan and Kamala put the dirty sheet and shirt and towel to soak in soapy water, and later washed and boiled them and hung them in the garden to dry.

Before the nurse left, she gave them the following general instructions :

1. Never expose the patient more than is necessary in caring for him.
2. Never allow visitors in the room when bathing him or giving a treatment. Never give him a treatment without first telling him something about it. Gain his confidence and co-operation.
3. Never whisper in the sick-room about the patient's condition even though he is delirious or unconscious. Patients often hear and understand even when they are too ill to talk or to let you know their wants.
4. Never have a patient face a window with the sunshine pouring in. Turn the bed or put up a curtain to shut out the glare.
5. Never tell a patient his temperature or discuss his condition with him.
6. Never sit on a patient's bed nor lean against it with your knee as you talk. Be careful not to knock against it in passing. The least jar may cause unnecessary suffering.
7. Be gentle but firm. Be cheerful but not noisy. Remember
• always the Golden Rule. Imagine yourself in the patient's place and do as you would be done by.

At first Mrs. Ranganathan was unwilling to leave her boy to Kamala's care at all, but when she saw how well the girl did things, she finally consented to lie down in an inner room and sleep from nine to twelve and from two to four, leaving Kamala in charge. After Mr. Ranganathan came home from work, he stayed with the boy while his wife and daughter went for a walk as the doctor had insisted they should. Kamala went to bed early and slept all night. Her mother stayed with Sundaresan. Early in the morning Kamala put on a clean cotton saree ('no silks and jewels while nursing') had her food, and went on duty.

She took the patient's temperature and respiration, brought him his nourishment, washed his face with warm water, gave him water and charcoal to rinse his mouth, and straightened his bedding. She sprinkled the floor with water and carefully swept it without raising the dust, then dusted the chair and stool and windows with a damp cloth. She went out to Narayanan's little garden and brought in two or three zinnias which she stood in a chembu on the stool to brighten the room. When everything was ready she wrote up her record to show the doctor whenever she might happen to come in. She did this in accordance with the general instructions which she had learned in her Home Nursing class at school.

CHAPTER VII

TEMPERATURE, PULSE AND RESPIRATION

The body is constantly generating heat, which is necessary to maintain life and to provide energy for the various activities of the body such as eating, studying, walking and working. The normal temperature of the body is 98.6°. This may vary a little in different persons accord-

ing to age, sudden change in the weather condition and the time of day. For instance, a baby may have a temperature of 99° while an old person's temperature may be between 97° and 98°. A person's temperature may be half a degree higher in the evening than in the morning.

A clinical thermometer is used to determine the temperature of the body. This is a narrow glass tube, with a very fine bore in which mercury rises, when heated, from a bulb at the bottom. The tube is graduated to record temperatures between 95 and 110° of the Fahrenheit scale. In order to take the temperature shake the mercury down about two degrees below normal. Place the thermometer under the patient's tongue to one side, and ask her to keep the lips firmly closed. At the end of three minutes it will register the temperature of the body.

Unconscious, delirious patients should have their temperature taken by rectum. Lubricate the bulb of the thermometer either with vaseline or oil and insert it about one inch into the rectum.

A detailed black and white illustration of a clinical thermometer. It is a long, narrow glass tube with a bulb at the bottom. The tube is graduated with a scale, showing numbers from 95 to 110. The mercury column is visible, rising to a point between 98 and 99. The tube has a small loop at the bottom for hanging.

A CLINICAL
THERMO-
METER

It should be kept there five minutes to allow for accurate registration. Be sure the rectum is not impacted

with faeces as this will cause the thermometer to register high while not really recording the temperature. The rectal temperature will be about one degree higher than the oral temperature.

Sometimes the temperature is taken in the axilla (under the arm) or groin but this is not a reliable way.

A Table of Temperature.

Collapse	95°
Sub-normal	96°-97°
Normal	98°-99°
Low fever	99°-101°
Moderate	101°-102°
High fever	102°-106°

Any rise in temperature above the normal, i.e., above 99° should be watched, and if it continues for more than two or three days a doctor should be consulted. Fever is a symptom of disease. The home nurse should observe it carefully and report it accurately. Whenever there is a rise in temperature the patient should observe the following rules:

1. Rest in bed.
2. Drink plenty of water.
3. Take only liquid or soft diet.
4. Keep the bowels open.

Drinking water is not harmful for a fever patient as so many seem to think. On the contrary, cooled, boiled water will not only relieve the excessive thirst of fever patients, but help in getting rid of the poisons in the body which are the cause of the fever.

Care of the Thermometer

This should be washed in cold water immediately after use, and put in a disinfectant solution for some minutes, depending on the disinfectant used. If carbolic lotion 1-40 is used, twenty minutes will be sufficient. To keep it there longer will erase the black figures and make the reading difficult. Methylated spirits may be used to disinfect the thermometer.

PULSE

The pulse is the transmission of the heart-beat to the blood in the arteries. When the heart muscles contract, the arteries are distended by the wave of blood which is being forced through them. This distention may be felt wherever arteries come near the surface of the body, notably the radial artery in the wrist, and the temporal artery in front of the ear. It may also be felt on the inner side of the ankle and the outer side and a little above the eye.

The average normal pulse-rate per minute is 72 in adults.

Adult men	60 to 70
„ women	65 to 80
Children	
„ 7 years old	80 to 90
„ 1st year	110 to 120
„ New-born infants	120 to 140

Whenever there is a rise in temperature, there will usually be an increase in the pulse at the rate of ten beats to one degree of temperature. There are exceptions to this rule as, for instance, in typhoid fever, when the temperature may be high and the pulse relatively low. In scarlet fever the pulse may be very high out of the

proportion of the temperature. When death approaches the temperature is very often sub-normal and the pulse very rapid and weak.

To take the Pulse

Place the index and middle finger over the radial artery at the thumb side of the wrist. Make slight pressure and count for a full minute. In counting the pulse the quality is also to be noted, whether strong or weak, regular or irregular. Note how many beats occur in the quarter minute. If the same number of beats are counted in each quarter or half minute, then the pulse is regular. Should the pulse be weak, it will disappear upon slight pressure so that it cannot be felt. Should you encounter difficulty in counting the pulse in one wrist, try the other, or try the temporal artery in front of the ear.

Do not place your thumb on the patient's wrist in counting the pulse. If you do, you may be counting your own pulse instead of the patient's.

A patient should be seated or lying down when you take her pulse, never standing. Let the arm be at rest, not suspended in mid-air.

The following factors will accelerate the pulse :

Exercise	Fever
Excitement	Hemorrhage
Eating	Shock
Heart-trouble	

Poisoning by certain drugs will slow the pulse.

Respiration

The average normal respiration is 10 to 20 inhalations and exhalations per minute. By respiration is meant the taking of fresh air into the lungs and giving out impure

air. Inspiration,—taking in oxygen ; expiration,—giving out carbon-dioxide. The act of inhaling and exhaling constitutes one respiration.

To count a person's Respiration

Place your hand on her wrist as though counting her pulse. In this way you will divert her attention from what you are actually doing. Then note the rise and fall of the chest-wall and count for a full minute. If a patient is aware of the fact that you are counting her respiration, she may unconsciously accelerate her breathing.

In counting a child's respiration, place your hand lightly over the chest or abdomen and count the rise and fall of the chest-wall. Exercise, excitement and fever will increase the number of respirations per minute.

Keeping Record

Temperature, pulse and respiration are very important symptoms in illness and should be very carefully noted by the home nurse. They should be taken at regular intervals, as 8 a.m., 12 noon, 4 p.m., and 8 p.m. Immediately they are taken they should be recorded.

The Record which Kamala kept for the Doctor's Information

Kamala ruled the pages of a small note-book according to the doctor's suggestion, and filled in a page every day, ending it with her mother's report of the night. Here is a sample page of her note-book.

May 11th

Time	Temp.	Pulse	Resp.	Move- ments of Bowels	Urine (Times passed)	Diet	Remarks
Day							
8 a.m.	101	90	23			*	Bath at 10 a.m.
12 noon	101.8	92	24	None	5		Restless. Headache.
4 p.m.	103.2	95	28				Refused food.
8 p.m.	103.4	95	28				Slept at noon 2 hours.
Night							
2-20 a.m.	103.3	95	28		3		Very little sleep.

* Diet

7 a.m.	Albumen water	...	...	1 o'clock.
10 a.m.	Barley gruel and milk	...	...
1 p.m.	Clear broth	...	...	1 o'clock.
4 p.m.	Whey.			
7 p.m.	Milk and gruel.			
10 p.m.	Barley-water.	Boiled water to drink between feedings.		

CHAPTER VIII

ENEMAS

When the doctor observed, by Kamala's record, that Sundaresan's bowels were not moving, she sent over the nurse again to give him an enema and left the apparatus for them to use when necessary.

HOW TO GIVE AN ENEMA

An enema is an injection of liquid into the lower bowel and is given for various purposes. It may be given to relieve constipation, to check diarrhoea, to stimulate the circulation and sometimes to give nourishment to the patient.

SIMPLE SOAP ENEMA

This is given to produce evacuation of the bowel and thus relieve constipation. The following articles are necessary :

An enema can with a rubber tube about $1\frac{1}{2}$ yards long.

An enema nozzle which is usually made of hard rubber.

Fill the can with soap-solution, using white soap and hot water.

Lay the patient on his left side with knees drawn up. Protect the bed with newspapers. Let some of the solution run through the tube to expel the air. Attach the nozzle to the end of the tube, and lubricate it with oil or vaseline. Insert the nozzle gently into the rectum, directing it backwards and to the left. Do not use force and do not hurry this treatment. If you allow the fluid to run in slowly at first the patient will not feel the discomfort that he will if you let it run in fast. Some can take more than others. When a sufficient amount has run in, remove the tube gently and carefully and ask the patient to retain the fluid for as long as possible. Have the bed-pan ready.

A less expensive outfit consists of a funnel and a rubber tube about a yard long, with a nozzle. Have a vessel containing the soap solution from which it can be poured into the funnel easily. Run some of the fluid through first to expel air, then insert nozzle in the rectum, so that no air will enter the tube.

SALINE ENEMA

A saline or normal salt solution enema is sometimes given to stimulate the circulation and to supply the body with fluid when there has been considerable loss of blood. It is made with common

salt, one level teaspoon to a pint of water. (A pint is about two tumblers). Boil the water and dissolve the salt in it. This enema should be retained as the fluid must be absorbed. Only small quantities should be given very slowly. After withdrawing the nozzle place a folded towel at the rectum, to help control the desire to expel it.

BORIC ENEMA

A boric enema is sometimes given to check diarrhoea. This is made by adding a large spoon full of boric powder to a pint (two tumblers) of water. Add the boric to the water and boil it. Allow it to cool before using it. It should be given warm enough so that the hand can just bear the heat comfortably.

As in the case of every discharge, Kamala poured phenyle into the bed-pan before emptying it into a special pot from which the sweeper took it. As typhoid germs pass out with the urine and faeces, she was especially careful to do this, and to wash her own hands in Lysol solution.

For six months after he recovered, Sundaresan used a special pot in the latrine, in which phenyle was kept, for fear that he might be a 'carrier' of typhoid germs.

CHAPTER IX

CONVALESCENCE

Sundaesan's fever continued for nearly a month. It was a long, hard, anxious period for his father and mother and sister, especially as they heard of deaths on every side. One of their neighbours lost his son after relapse when he was nearly well, and this made them be doubly careful that Sundaesan should not move too much or sit up or take any solid food without the doctor's permission. The doctors and nurses were too busy caring for the ignorant to help them any more, so Kamala and her mother carried on the baths and enemas, and fed the patient for days at a time without a visit from the doctor. Everyday Mr. Ranganathan took Kamala's record to the dispensary, showed it to the doctor, and brought back medicine or suggestions or merely approval. There were nights when the boy was delirious and days when he could not rest unless his sister sponged him with cool water and kept cool, wet cloths on his aching head. It was hard work to wash and boil the few sheets and shirts they had, so that the boy might be always cool and fresh and clean. It was still harder to keep cheerful and bright so that he might not guess their anxiety when they heard the drums of funeral processions.

Then at last the wavering temperature came down and stayed down, and one joyful day it registered normal. Soon Sundaesan began to feel so much better that he tried to sit up, and rebelled very much at staying in bed. He began to be ravenously hungry, and it took all of his



A CONVALESCENT PATIENT

*'When I was sick and lay abed
I had two pillows at my head,
And all my toys around me lay,
To keep me happy all the day.'*

mother's strength of will to refuse him the solid food that he begged for. In spite of the joy of release from anxiety, this period of convalescence was, very hard for the family, for the boy was cross and irritable and peevish. Kamala borrowed story-books from the library of her old school and read aloud to him by the hour, or told him stories and kept him busy. They had to feed him very carefully on soft foods which he did not like.

At last the doctor came in, and said that he might sit up in a chair twenty minutes in the morning and twenty minutes in the afternoon, increasing the amount daily. Sundaresan, who had scoffed at this while sitting up in bed, found that when he tried to walk a step or sit up he was as weak as a baby, and very glad to lie down again. The doctor, however, gave permission for the other children to return home and suggested that Kamala go away for a change and rest before school should open.

'My brave little home nurse!' she said approvingly, patting her shoulder. 'I shall never make fun of Home Nursing again. No doubt you hastened your brother's recovery and perhaps you saved his life. Certainly you spared my assistants and me a lot of worry and trouble when we found that you could be left to carry on.'

'I don't know what we should have done without her,' echoed her mother. 'At her age I should have done nothing but weep and wail and get in other people's way. This new education for girls is a very good thing. Thank God, my boy is spared to me!'

CHAPTER X

SCABIES

Before Kamala left on her vacation, however, she was able to help another member of her family with the knowledge which she had acquired at school. When Rajan came home after a month in the care of his aunt, his mother was distressed to find him covered with 'itch', which he had caught from his cousins. We have already studied the causes of this loathsome skin-disease,¹ so we shall only follow the treatment. As Kamala had practised on a number of children at school, she knew just what to do. Her mother was applying ointment to the surface of his skin, above the nasty pus-filled blisters. '

'Oh, Amma,' protested Kamala. 'That won't accomplish anything. The itch-*poochies* are down underneath the skin, and the medicine must touch them. We must prick the blisters and squeeze out the pus, and rub till the blood comes before we put on the medicine.'

As the child's buttocks were covered as well as his hands, Kamala filled a basin with hot water which she poured from a height on a piece of soap to make suds. She added a little bit of Lysol solution, and then cooled the water so that the child could sit in it, and hold his hands under water. As he got used to the heat she poured in more hot water little by little till it was as hot as he could bear. After twenty minutes of soaking like this, the skin was softened. Mrs. Ranganathan held the indignant baby across her lap while Kamala opened each sore with a needle which she first dipped in a little Tincture of Iodine, or held in the flame of a candle. After pricking and squeezing out every bit of pus, she rubbed away the

¹ See p. 166.

old skin with a rag until a round, red opening was left. Despite the baby's screams she continued till every sore was open, then wiped his buttocks dry and rubbed the sulphur ointment well into the open sores. When his buttocks were finished she began on his hands and treated them in the same way. Then, while her mother put a clean old slip on him, she washed his dirty clothes, boiled them and hung them out in the sunshine. They kept him in the back courtyard away from the rest of the family.

That night before Rajan was put to bed, they went through the same process of bathing him, washing the newly-gathered pus out of the sores and applying sulphur ointment. They changed his clothes again, and tied up his hands in little bags which Kamala had made out of old scraps of cloth, to protect his bedding.

For three days they continued these hot baths, changes of clothes, and scrubblings until the sores were nearly healed, and then they put ointment only on the new blisters, for too much sulphur burns the skin. They rubbed the healing sores, which had no pus, with oil to help them heal and to keep the skin soft.

Tincture of Iodine applied to new sores, followed by zinc ointment twice a day, is another way. In any case, the itch-mite must first be killed with sulphur or iodine, and then the sore healed. A healing ointment will not kill the mites. Too much sulphur or iodine irritates the skin. The two must be used together.

Remember that *hard work*, and not magic, will cure scabies and prevent its spread.

If children are kept clean, if their blood is in good condition, and if their clothes are frequently changed and washed, they can resist infection by scabies. If the first blister is neglected, the disease spreads.

CHAPTER XI

TREATMENTS AND APPLICATIONS

(From Kamala's Note-book)

The following treatments and applications will often be ordered by a doctor in case of illness, and it is well for the home nurse to have some knowledge of them.

Local Applications or Counter-irritants

These are given to allay deep-seated inflammation, to relieve pain and stimulate circulation in a particular part. The symptoms of inflammation are redness, heat, swelling and pain.

1. LINSEED POULTICE

Linseed can be purchased in the bazaar and should be ground to a powder. Have a saucepan half full of boiling water. The water should be bubbling. Remove it from the fire. Stir into this enough of the linseed meal to make a stiff paste. Keep stirring it all the time, adding the linseed gradually. Stir it well so that it is free from lumps. A little baking soda (soda bicarbonate) added to the paste will make it very light.

Have ready beforehand a piece of old cloth twice the size of the poultice needed. On one half of this cloth spread the linseed paste with a knife. Fold the edges of the cloth three-quarters of an inch. Turn the other half of the cloth over the paste and fold in the edges evenly. Apply this to the inflamed spot at once and cover with cotton wool and thick paper, and tie it firmly with a binder or bandage. If it is well covered with paper and cotton it will retain the heat longer.

The poultice may be left on for an hour. It should be borne in mind that a cold poultice is useless and causes discomfort to the patient. Before you put it on, try it on your own hand so that you will not burn the patient. The paste should not be so thin that it oozes out of the cloth.

Sometimes mustard is used with the linseed. This may be purchased in the bazaar and ground into powder. Mix one part of mustard powder with eight parts of linseed.

Instead of linseed *bran* or *rugi-flour* may be used. Since linseed has more oil it retains the heat longer, so linseed is better if available. Half linseed and half bran or rugi makes a good poultice. Add mustard in the same proportion of 1 to 8 if a mustard poultice is ordered.

2. MUSTARD PLASTER

White flour and Coleman's Mustard (a tinned variety sold in shops) are used. Have ready first a piece of thick brown-paper and old thin cloth the size of the plaster required, allowing an extra $\frac{1}{4}$ inch all around for turning in the edges.

To four parts of flour add one part of mustard. Mix well and see that there are no lumps. Spread this on the paper. Fold the edges of the paper $\frac{1}{4}$ inch all around. Cover with the cloth and fold its edges under. This makes a neat-looking plaster. Apply over the afflicted part with the cloth side down. Leave the plaster on for from twenty to thirty minutes or until skin is well reddened. When removing the plaster, wipe the skin dry so that no particle of mustard remains, and apply vaseline or oil.

Caution: If hot water is used to mix the flour and mustard, the volatile oil of the mustard will evaporate and render the plaster useless.

For a child use 8 parts of flour to one part of mustard. A child's skin is very tender and will blister more readily than an adult's. You need not remove the plaster the instant a patient tells you that it is 'burning and pricking'. Watch the colour of the skin. For children it is well to apply oil or vaseline before putting on a plaster.

Mustard plasters are often ordered to relieve sore throats and pain in the chest due to severe cold. They are also applied over the stomach for persisting vomiting.

3. BRAN AND SALT BAGS

Small bags made out of some soft material are filled with bran or salt. They can be heated in a frying-pan or on a piece of tin over the fire. When they are moderately hot they may be applied to the affected area. These are often used for toothache and ear-ache.

4. HOT WATER FOMENTATION

Have ready a basin containing hot water and a small charcoal stove to keep it hot while giving the treatment. You will need two pieces of flannel, each a 12-inch square, and a towel or a piece of strong cloth about the size of an ordinary towel. Place the pieces of flannel in the water and allow them to become thoroughly heated. With a stick place one of them in the centre of the towel or cloth and twist the ends of the towel in opposite directions until you have squeezed the flannel as dry as possible. Then shake it

out to allow some of the steam to escape, and place it on the part which is requiring the fomentation. Cover this with a piece of oil-cloth, or with a folded towel and thick paper. Change it as soon as it cools. Continue this for twenty minutes. Wring the second piece of flannel out of the water before removing the first.



PREPARING A HOT FOMENTATION OR STUPE

The flannel has been taken out of the boiling water with a stick and placed in the centre of a dry towel. The nurse is squeezing the water out of the flannel by twisting the towel, and thus she retains the heat without burning her hands.

Hot-water fomentations are given for painful joints to reduce swelling and to stimulate the circulation in certain parts. It can be used for a whitlow on the thumb-nail or finger-nail.

Sometimes the doctor will order a fomentation with turpentine in it for the abdomen. This is called a stupe. It may be given by adding a tablespoonful of turpentine to a basin of water or by sprinkling about 60 drops of turpentine on the flannel before immersing it in the hot water. Care should be exercised not to blister the patient with the turpentine, nor burn her with the hot flannel. Try it on your hand first and gradually place it on the affected part.

FOMENTATIONS FOR THE EYE

The eye is a very delicate organ and a very precious one. When fomentations are given to the eye, great care and gentle handling are essential. Compresses made of gauze and cotton-wool are the best, but if these are not available the best thing at hand may be used. Pladgets of cotton-wool about $2\frac{1}{2}$ inches square, or soft white cloth folded in several layers, the same size, may be used. Cotton-wool will retain the heat longer than ordinary cotton cloth.

Have a very clean vessel—preferably white enamelled—and fill it half full of moderately warm water. Very hot water cannot be borne on the eye. Place the cotton-wool pladgets in the water and allow them to become warm. Use a spoon to remove it from the water. Place it in the centre of a small piece of cloth or a large clean handkerchief and wring it as dry as possible. Place it over the eye and cover it with cotton-wool. Change it as soon as it becomes cool and continue this for twenty minutes.

When both eyes are to be fomented, use separate vessels or do one at a time, changing the water and also the compresses for each eye. Boil the basin before doing the other eye. Never use the same compress for both eyes for you may carry infection from one to the other.

If there should be a pus-y discharge from the eye, carefully wipe away the pus before fomenting and burn the cotton-wool used in doing so. Be careful to wash and disinfect your hands after the treatment as you may carry the infection from the patient to your own eyes or the eyes of others.

Sometimes boric lotion is used in fomenting the eye. Add a level teaspoonful of boric powder to a tumbler of water and boil it. When it is cool enough it may be used as described for the hot water fomentation for the eye.

CARE OF WOUNDS

If the home nurse should be called upon to assist a doctor in caring for a surgical wound she will need to make certain preparations :

Nothing unsterile (i.e. containing harmful bacteria) should come in contact with the wound. If the doctor is going to use instruments these must be boiled in a covered saucepan for ten minutes. Take the saucepan off the fire and bring it to the patient's bedside without removing the cover or touching the instruments. The doctor will remove them after he has scrubbed and disinfected his hands.

If sterile dressings are needed, these may be boiled along with the instruments. They will be wet when applied, but a sterile wet dressing is better than an unsterile dry one. Old soft cloth may be used, also cotton wool. Bandages may also be steamed over the mouth of a pot of water in a strainer.

All wounds, whether they are surgically clean or not, should be carefully treated. Infected wounds may be washed with a normal salt solution—one teaspoonful of salt to two tumblers of water. After washing the wound with this solution, an antiseptic dressing

should be applied. Neglect of dirty wounds will cause the bacteria to multiply rapidly and thereby retard healing, and may in some cases cause serious results. Neglect of a wound in the leg may cause the infection to spread so that loss of a limb may result.

Remember too that any small abrasion of the skin may become the avenue of entrance of harmful bacteria to the body. Neglect or careless handling may cause untold harm and endanger life. Keep a bottle of Tincture of Iodine or Mercurichrome at hand, with swabs made of broomsticks wound with cotton. When you cut yourself or scratch yourself, paint the place with iodine, to avoid trouble.



GIVING AN INHALATION

This little girl has a bad cold and cough so the nurse is preparing to give her an inhalation. She has put a few drops of Tincture of Iodine and Eucalyptus Oil from the bottles into the kettle of boiling water, and will now make a little tent out of the blanket to prevent the steam from escaping, while the child sits inside and inhales the heated vapour through nose and mouth. She should inhale it for twenty minutes, then wrap herself in the blanket and go to bed.

PRACTICAL WORK

1. Make a bed for a patient, as Kamala did. Plan how a family who had no sheets or bed could make a patient comfortable on the floor or on benches. How could they keep the patient clean in such circumstances?
2. Practise changing the sheets without letting the patient sit up. See how quickly and easily you can learn to do it.
3. Practise giving a cleansing-bath and a bath to reduce temperature, to a person in bed, without moving her very much.
4. Count the pulse and respiration of the person who sits next to you. Find the average for the class.
5. Take someone's temperature and disinfect the thermometer. If possible, keep a record of a fever-patient's temperature, pulse and respiration, as Kamala did. If you have no real patient to help in this way, make a temperature-record in the form of a *graph* of Sundaresan's temperature, supposing that successive pages in Kamala's note-book had the following record :

May 12 :	101·8	102·2	104	104·3
May 13 :	102·2	102·8	104	104·4
May 14 :	102·8	103·4	104·4	104·8
May 15 :	103·4	103·8	105	105·4 etc.
6. Practise washing itch-sores for some child, as Kamala did.
7. Make a mustard-poultice, a mustard-plaster, a linseed-plaster and a salt or bran-bag. Practise giving a hot fomentation.
8. Practise changing the clothes and combing the hair of a sick person without letting her sit up.
9. Practise sterilizing bandages in the way described, or by steaming them in a strainer over the mouth of a pot of boiling water.
10. Make a list of the supplies or medicines or disinfectants which you find mentioned in this chapter, which would be useful to keep in the family medicine-cupboard. Find out where they can be obtained if you ever need them in a hurry.
11. Visit the operating-room of a hospital to see how much care is taken in the preparation of bandages, instruments, clothes, etc. used in operations.
12. Visit a hospital-ward in the morning when the nurses are giving baths and enemas and making beds.

QUESTIONS

1. Why should you not whisper in the sick-room?
2. Why should you not tell the patient her temperature or discuss her condition with her?
3. Why is it not good for a person who is ill to have visitors?
4. If you went to visit your mother when she was ill in the hospital, would you talk to her about what troubles you are having at home?

5. If you visited a patient with typhoid, would you tell him stories of people who died of typhoid?
6. Is it good to stand medicine-bottles in a row in front of the patient, or would a vase of flowers be better?
7. What would you say to a grandmother who insisted that fever-patients must not drink water or have a sponge-bath?
8. Why did Mrs. Ranganathan send the other children away for a month when Sundaresan had typhoid?
9. What quiet games could you play by the bedside with a convalescent patient to keep him busy and happy without excitement?



A COOKING CLASS

Preparing food for the School Hospital

CHAPTER XII

INVALID DIET

Kamala found that diet was a very important factor in the care of Sundaresan while he was ill. The doctor's orders had to be carried out, but she did not find it easy to feed the boy who was fretful and hard to please. She learned that he would take most easily food which was well-cooked and attractively served. Tempting dishes brought him as much pleasure as the flowers by his bedside. The doctor prescribed the diet for each day, and Kamala looked up in her Home Nursing note-book the explanations and directions which she had studied at school, so that she or her mother could prepare the necessary nourishment and understand the reason for it.

More Notes from Kamala's Note-book

Sanitary and happy surroundings, freedom from chill, exhaustion, overwork and worry, help to keep one well, but good food is one of the greatest helps to keeping good health. A well-fed person is more able to resist harmful germs than an under-nourished person. In times of illness it is necessary to carry out the doctor's instructions regarding diet. The home nurse must use her ingenuity both to please the patient and to do what the doctor says. The better she understands the principles of feeding, the better can she handle such a problem.

The first thing one must do is to free the mind from the idea that there is a magic diet for any disease. As in health there is a variety of foods, for purposes of fuel,

building and regulation, so in illness there are the same groups of foods, but with more restricted choice. During the first day or two of illness, fasting or taking of very little food does no harm and may help toward recovery by giving the stomach a chance to rest if digestion has been upset. The work of the body goes on, so after a day or two enough nourishment must be given to meet the body's requirements.

Diet during Fevers

Fever is an abnormal condition known by elevation of body temperature, quickened respiration and circulation and a certain amount of tissue-waste. Fever is often due to infectious diseases, disturbed digestion or local inflammation. Those which last a short time such as the temperature that accompanies colds, tonsillitis, chicken-pox and at times malaria and dengue fever, do not cause enough tissue-waste to make the diet the important part of the treatment. In all fevers of this kind the points to remember are (1) relieving the cause, (2) preventing indigestion, and (3) saving the heart and kidneys from extra strain. In order to do this the best form of diet is liquid diet, given in small quantities at short intervals. Two-hour intervals are best at the beginning, lengthening the interval as the fever decreases, and increasing the amount. During convalescence semi-solid or soft food can be given, and gradually changed to normal diet.

During fevers digestion is often upset so that food cannot be retained. If this is the case, nourishment should be in the form of fluids which relieve thirst and help to eliminate waste-products. At first the fluids other than water should be slightly nutritious, as conjee-waters, whey, broth or dilute fruit-juices (lime-juice, orange-juice, prickly-pear-juice,

pine-apple-juice or guava-juice). Lime-juice coloured with prickly-pear-juice is attractive to the eye.

Milk is an ideal fever-food. It is high in protein, so it should be combined with milk-sugar or conjee-water to make a balanced diet. (A tablespoonful of milk-sugar to a cup of milk, or half a cup of conjee-water to half a cup of milk.) Milk feedings sometimes leave a sweet taste in the mouth which is disagreeable. It is a good plan to wash out the mouth with water or weak lime-juice after each feeding.

Fluid Diet

The following foods make up a fluid diet :

Milk (plain).	Fruit-juices (plain).
Peptonized milk.	Fruit-juices with albumen.
Albumen water.	Fruit-juice with raw egg.
Albumenized milk.	Egg Flip.
Buttermilk.	Ginger-ale or soda-water with milk.
Goat's milk.	Cocoa.
Malted milk.	Thin, strained conjee.
Ovaltine.	Broths, plain or with egg.
Whey.	Soda-water, plain or with fruit-juice.

The following plan may be used as a guide for short-time fevers :

- 7 a.m. Barley water 4 oz. ; milk 2 oz.
- 9 a.m. Orange-juice with egg.
- 11 a.m. Malted milk (3 oz. powder, 3 oz. milk).
- 1 p.m. Mutton broth with milk (6 oz.) or conjee-water with milk.

3 p.m. Orange-juice with egg-white.

5 p.m. Strained rolong (ravai) gruel.

7 p.m. Hot Ovaltine (6 oz.)

9 p.m. Hot milk (6 oz.)

Midnight Hot malted milk (6 oz.)

4 a.m. Hot milk (6 oz.)

If the patient sleeps, omit night feeding.

Soft Diet

Milk-soups; eggs soft-cooked, creamed or poached; soft or baked custard; junkets; toast; itli; conjee; fruit or mashed and strained vegetables; twice-boiled rice; fruit-whip; broiled chicken or tender mutton.

A plan for a day's soft diet:

- 7 a.m. Conjee (strained ragi).
 1 soft-cooked egg.
 1 slice toast.
 1 cup milk flavoured with coffee.
- 10-30 a.m. Albumenized orange-juice.
- 12-30 p.m. Broth with milk, or pepper-water (mild).
 Twice-boiled rice with ghee.
 1 cup buttermilk.
- 3-30 p.m. 1 cup milk.
- 6 p.m. 2 slices toast or well-boiled rice.
 1 cup hot milk.
 Mashed prunes or plantain, or piece of papaya.
- 9 p.m. 1 cup of Ovaltine.

In returning to normal diet, care must be taken not to upset the digestion or raise the temperature again by over-feeding.

Diet in Typhoid or Enteric Fever

In typhoid fever diet is of the utmost importance; the life of the patient depends upon absolute obedience to the doctor's orders. The home nurse must watch every mouthful that the patient receives. One mistake may prove fatal.

As in other fevers there is an increased expenditure of energy by the body, but there is also more wasting away of the tissues due to the bacteria which cause the disease. These lodge in the wall of the intestine and cause ulcers, giving off poison which circulates and is absorbed by the whole body. On account of these ulcers the diet must not irritate or cause distention of the intestinal walls. The food must be very easy to digest and free from any particles of solid materials. This disease lasts from four to six weeks, and all this time the diet must be carefully planned. At first little food of any kind is given, and this should be a strictly fluid diet made mostly from milk. Lactose (milk sugar) should be added to increase the food-value. Sometimes the patient will enjoy a little variety, such as barley-water with milk, whey, or junket.

INCREASING THE DIET

It is advisable to be cautious in adding new foods to the diet. Gradually add to the fluids soft diet such as milk, lactose (milk sugar), fine strained conjees, twice-boiled rice, sago, custard, junket, eggs (poached or soft-cooked), toast, fruit-juices, Ovaltine, buttermilk, malted milk. Coffee may be added for flavouring. Meat is not given until the patient is well and then only in the most digestible form. The doctor's orders should be carried out strictly and he should be consulted whenever difficulties arise, for it is necessary that the patient be well-fed and

yet be able to tolerate the food given. If the patient takes a dislike to milk, flavour it with a little coffee.

Diet during Tuberculosis

The diet for tuberculosis depends largely upon the condition of the patient. As in typhoid fever the amount and kind of food is of great importance. In this disease the appetite is poor and is not a good guide. Often the patient must eat when he does not feel like it.

In selecting foods the value of Vitamin A should be remembered. Therefore, milk, eggs, ghee or butter, and cod-liver oil should be used. Green vegetables are good if the patient can digest them. If these are strained, or their juices made into soup, they can be digested. Fruit and fruit-juices too are desirable for their vitamin value.

A well-balanced diet is required, attractively prepared, arranged to meet the need of the individual patient, and given three times a day regularly with an extra tumbler of milk between meals. At the Arogyavaram Sanatorium a great deal of ragi-conjee is used. This or whole wheat and more vegetables will be needed if the patient is constipated. The weight should be watched and the diet increased if necessary. Because indigestion is common, the patient should not be stuffed.

Diet for Diarrhoea

STARVATION

The entire digestive tract needs absolute rest for a certain period—no food and very little water. This should continue for 12 to 36 hours, depending upon the violence of the attack. This gives the poisons causing the trouble time to pass out of the body.

DIET

The first day after starvation a cup of weak tea, peptonized milk, well-skimmed meat-broth or albumen-water should be given every four hours. Milk, unless peptonized, should not be taken, as it forms curds in the stomach which decompose with the production of poisonous substances and irritate the inflamed intestines.

INCREASING THE DIET

As the diarrhoea decreases, the following food may be added gradually: (Always remember that too much food will cause the diarrhoea to return.)

Soft-cooked eggs, toast, cocoa made with water, well-cooked rice, junket, soft custard.

When the patient is entirely free from diarrhoea, carbohydrate foods and more solid foods can be taken. Do without sugar for some time as it ferments easily.

POINTS TO REMEMBER

1. Only foods which are known to agree with the patient should be given.
2. Food should be simply prepared. No fried food or spices.
3. Foods which ferment easily, such as sugar, should be withheld.

CHRONIC DIARRHOEA

The diet is the chief point to consider. Never eat indigestible foods, nor eat when over-tired.

Diet for Dysentery

The diet consists entirely of liquids as in diarrhoea. The same outline should be followed.

Diet for Indigestion

Indigestion is caused mainly by errors in the diet. There are other reasons, such as inheriting a weak digestive system. But by care in childhood this condition can be overcome. Lack of fresh air, poor and dirty food, unwholesome surroundings, crowded and badly ventilated sleeping-rooms, over-tiredness, and unhappiness all combine to cause a bad digestion.

ERRORS

A child may be allowed to eat any and all kinds of unsuitable food, and then, when the stomach gives trouble, medicine is given but the diet is not changed. Eventually one has one of two conditions :

1. *Hypo-acidity* or not enough acid.
2. *Hyper-acidity* an excess of acid.

The physician determines which condition is present.

Diet for Hypo-acidity

- i. Boil drinking-water to destroy bacteria.
- ii. Use carbohydrates in the form of starch rather than sugar. (Starch does not ferment as easily as sugar.)
- iii. Limit the foods, such as fats, which take a long time to pass through the stomach.
- iv. Do not take soda bicarbonate as this further reduces the acid content of the stomach.
- v. Let the foods be appetizing and savoury. This stimulates the flow of the gastric juice.

Diet for Hyper-acidity

When a severe attack of indigestion comes, starve for one day, and then take a fluid diet such as broth or bovril, albumen-water, buttermilk, albumenized fruit-juices or barley-water.

INCREASING THE DIET

On the third day increase the diet by adding toast softened in milk, twice-boiled rice or conjee, broth, unsweetened biscuits, soft-cooked eggs. Gradually increase the diet to normal.

Those who have attacks of indigestion should always regulate their diet carefully, avoiding the foods which upset them and choosing the alkaline-producing foods.

*Foods rich in
Alkali-producing Elements**

Green leafy vegetables, as

Greens

Cabbage

Lettuce

Tuber and root vegetables, as

Potato

Carrot

Onions

Radishes

Yams, etc.

Fruit, as

Plantains

Oranges

Mangoes

Papayas

Guavas

Pine-apple, etc.

*Foods rich in
Acid-producing Elements**

Meat

Dhals

Pulses, as

Peas

Beans

Grams, etc.

Nuts, as

Cocoanut

Ground-nut

Almonds

Walnuts, etc.

Cereal Grains, as

Wheat

Rice

Ragi

Cholam

Kambu, etc.

* McCarrison's *Food*, pp. 24, 25.

QUESTIONS

1. Mention a variety of ways of cooking eggs for the sick.
2. Explain why it is that liquid foods are generally prescribed for the sick.
3. Keeping in mind the fact that only easily-digested foods should be given to the sick, make a list of foods which would be suitable.
4. Plan some meals for Sundaresan during his convalescence.
5. Plan a day's meals for a person who is sick in bed with a bad cold.
6. What sort of appetite do sick people have?
7. Do the sick have trouble in digesting their food?
8. What can you do to make a patient enjoy his food? What will be the effect?
9. Suggest ways by which food can be served attractively to the sick.
10. Review the Physiology of Digestion.

PRACTICAL WORK

Problem: To learn to prepare a variety of suitable foods for the sick, and for little children, as recommended in Chapter IV of Section II.

RECIPES

ABBREVIATIONS

- 1 c. = 1 cup.
1 tbs. = 1 tablespoon.
1 tsp. = 1 teaspoon.

TABLE

- 16 lb. (dry) = 1 cup.
12 lb. (liquid) = 1 cup.
3 tsp. = 1 tablespoon.
10 level tablespoonfuls (dry) = 1
 ollock.
15 level tablespoonfuls
 (liquid) = 1 ollock.

Soft Custard

- 1 egg (or 2 yolks).
1 tbs. sugar.

- 1 cup milk.
Flavouring.

Method:

1. Heat milk in saucepan.
2. Beat egg and sugar together.
3. When milk has reached the scalding point (small bubbles form around the edge of the saucepan), stir in the egg and keep stirring until the spoon is coating (milk sticks to back of spoon) remove immediately.
4. Care must be taken not to cook the custard too fast or the custard will curdle.

5. If the mixture curdles, set the saucepan in a basin of cold water and beat until the curd disappears.

Note.—This can be served with the white of the egg whipped and floated on the top. This appeals to children when it is called 'Floating Island'.

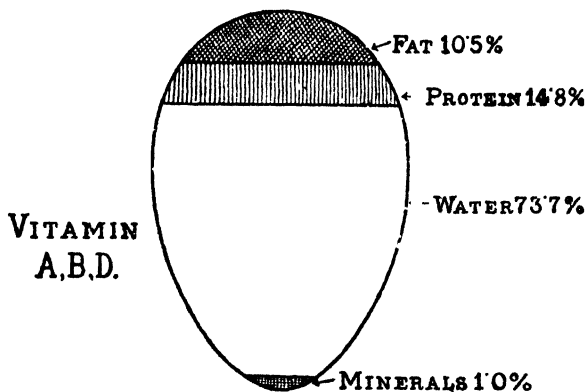
Baked Custard

1 egg. ¾ cup milk.
1 tbs. sugar. Flavouring.

Method :

1. Beat egg and sugar together, stir in the milk, grease cups with ghee and pour in the mixture.
2. Set cups in pan of water (about half full) and cover.
3. Bake slowly until custard is firm in the centre.

(This is tested by sticking a knife in ; if it comes out clean, the custard is ready.)



COMPOSITION OF EGG (Diagrammatic)

Coddled Eggs

2 cups boiling water. 1 egg.

Method :

1. Allow water to boil.
2. Wash egg.
3. Drop into boiling water and place saucepan where water will keep hot, but not boil, allow to stand 7 to 8 minutes.
4. Serve with salt.

Soft-cooked Eggs

1. Same as for coddled eggs but allow egg to remain 10 to 15 minutes, if very soft eggs are not desired.

Poached Eggs

1. Have small shallow pan half filled with boiling water.
2. Break an egg into a large spoon or egg cup and place in the water (it should not boil).
3. Allow it to stand in hot water until the white is firm or jelly-like.
4. Slide egg on to hot toast (taking care not to break).

Toast

1. 1 slice of stale bread, $\frac{1}{4}$ inch thick.
2. Brown the bread on both sides slowly until thoroughly dry.
3. Toast should be crisp and brown to be easily digested.

Toast Water

1. Prepare toast.
2. Break into small pieces into a cup of boiling water.
3. Let it stand one hour, add salt, and strain. It may be served hot or cold. (Good in case of dysentery.)

LIQUIDS**Albumen Water**

- 2 whites of eggs. 1 cup water.
Put into a bottle and shake thoroughly.

Orangeade

- | | |
|--------------------|---------------------------------|
| Juice of 1 orange. | Juice of half a lemon. |
| 1 tbs. sugar. | Enough water to fill the glass. |

Method :

1. Sweeten the juice of orange and lemon and pour into a tumbler.
2. Fill tumbler with plain water or soda water.

Albumenized Orangeade

1. Make orangeade as directed in above recipe without the addition of water.
2. Break the whites of two eggs into a saucer and with scissors cut the albumen until free from membrane; and strain. (If scissors are not available break membranes with fork and strain.)

Stir this into the orange-juice.

(This is nourishing and good, and taste of the egg is not detected.)

Albumenized Lime-juice

Do as directed for orange-juice.

Note.—(To make it appeal to the patient, add a little juice of the prickly-pear. The colour appeals to the appetite.)

Albumenized Milk

Same directions as for fruits.

Egg-white and Mint

- | | |
|---------------|-------------------------------|
| 1 egg. | 1 tsp. lime-juice. |
| 2 tbs. sugar. | Several leaves of fresh mint. |

Method :

1. Whip white of egg ; add sugar and lime-juice.
 2. Crush mint leaves slightly and place in tumbler.
 3. Fill 1 tumbler with soda water.
- (This is good when patient is suffering from nausea.)

Egg Flip

- | | |
|---------------|-------------|
| 1 egg. | 1 cup milk. |
| 1 tbs. sugar. | Flavouring. |

Method :

1. Beat egg and sugar together.
2. Add milk.
3. Beat white of egg and stir into the mixture.
4. Pour into tumbler and flavour.

Imperial Drink

$\frac{1}{2}$ oz. cream of tartar, 2 tbs. sugar, juice of two limes.

Method :

1. Place ingredients in bowl, cover with 4 ollocks of boiling water.
2. Let stand until cold.

Coffee Eggnog or Egg Flip

Follow recipe for plain eggnog adding 2 tablespoonfuls of strong coffee for flavouring.

Malted Milk Eggnog

- | | | |
|--------|---------------------|---------------------------|
| 1 egg. | 1 tbs. malted milk. | $\frac{1}{2}$ tbs. sugar. |
|--------|---------------------|---------------------------|

Method :

1. Mix sugar and malted milk and egg yolk.
2. Add milk, slowly mixing.
3. Stir in beaten white and serve.

Peptonized Milk

2 ollocks of milk.

- 1 tsp. of Fairchild's peptonizing powder.

Method :

1. Dissolve the powder in one spoon of cold water, and place in a clean bottle (glass).

2. Pour in milk and stop the bottle with cotton, shake well and place the bottle in a saucepan containing water warm enough to allow of the hand being immersed without being burned.
3. Keep the water at this temperature for 5 to 10 minutes. Lift out of the warm water and plunge into cold, and keep it cold.
4. The milk may be poured from bottle into a clean saucepan and brought quickly to a boil to prevent further peptonization. This might make the milk very bitter unless it is to be flavoured with fruit juice.

Note.—This is a predigested food—and is good for patients who have had a severe shock to digestive system.

Plain Junket

(Predigested food).

$\frac{2}{3}$ cup milk.

Nutmeg.

$\frac{1}{2}$ junket tablet.

1 tbs. sugar.

Method :

1. Heat milk *luke-warm*. (Warm so that a drop is not felt on the wrist.)
2. Add junket tablet dissolved in 1 tbs. cold water.
3. Mix sugar and flavouring, and pour into cups, and place in a cool place without jarring.
4. When junket becomes firm, it is ready to serve.

Whey No. I

2 ollocks milk.

2 tsp. rennet.

Method :

1. Warm milk and add rennet
2. Set aside in a warm place for 15 minutes.
3. Break up curd by stirring with a fork.
4. Let it stand for 15 minutes; then strain the whey through muslin and bring to boiling-point.

Lime-Whey No. II

1. To 2 cups milk add $\frac{1}{4}$ cup lime-juice.
2. Boil without stirring until whey separates from the basin.
3. Strain through several thicknesses of gauze.
4. Cool and serve.

Rice-water

1. Soak one tablespoon of well-washed rice in one quart of hot water for three hours.
2. Then boil slowly for three hours and strain.

Barley-water

2 lb. barley flour.

2 tbs. cold water.

2 cups boiling water.

Salt to taste.

Method :

1. Mix flour to a smooth paste with cold water and gradually add the boiling water, stirring all the time.

2. Cook slowing about thirty minutes ; add salt, and strain before use.
(If desired, add one tablespoon of lime-juice.)

SOUPS

Mutton Tea

1 lb. mutton. ½ tsp. salt.
2½ ollocks water.

Method :

1. Remove all fat and wipe meat with a damp cloth.
2. Cut it into small pieces and put it in a jar with water and salt for two hours.
3. Place the jar in a saucepan of cold water and gradually heat it until it simmers (below boiling)—keep it at this temperature for one hour.
4. Bring slowly to boiling-point when the liquid will become a deep chocolate colour.

Chicken or Mutton Broth

2 lb. meat. 2 lb. bones.
2 qts. water. 1 tsp. salt.
2 tbs. rice or barley (if desired).

Method :

1. Wipe meat with a clean cloth and cut into small pieces, break bones, place all together in clean saucepan.
2. Let stand for one hour, then heat gently to boiling-point. (Broth must never do more than simmer) ; and let simmer for three hours.
3. Strain and cool and when cool, remove all the fat.
4. Measure and add enough water to bring to original quantity.

Note.—This leaves a liquid which stimulates appetite but has practically no food value.

Milk Soup

1 cup milk. 1 tbs. butter or ghee (if allowed).
1 tbs. flour. ½ tsp. salt.

Method :

1. Make flour into a paste with a tablespoon of cold water.
2. Heat milk and salt and add flour mixture.
3. Flavour with ¼ cup of vegetable juice such as carrot, greens, potatoes or a small amount of onion juice.

Fruit Whip

1 egg white. 1 tbs. sugar.
2 tbs. fruit pulp. 1 tsp. lime-juice.

Method :

1. Mash cooked fruit such as mango, guava or pear through a strainer, and mix with sugar and lime-juice.
2. Beat white of egg stiff.
3. Fold mixtures together and serve.

PART IV

Home Economics

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A DESCRIPTION OF DEBT

‘Those who are not ashamed to be in debt do not hesitate to tell lies, commit forgery, produce false witnesses, break promises, take bribes, rob and kill. So Debt is the forerunner of a train of sins.

• A man who loans money to others expects his principal with interest. Depending on this principal and interest, he borrows money from others when he himself gets into trouble. Then, unable to get back his original loan, he gives up all his efforts to better his prospects and wastes his time in worrying his debtor for the money for days at a time. He follows his debtor wherever he goes. When he fails to get the money, he wastes more time, energy and what is left of his property in dragging the debtor to that charitable institution, the court. When he lacks funds for court expenses he borrows more money. Even when he wins his case he tries to get out of his debtor grain and seed. When he trades with the borrowed produce and is unable to raise enough to pay off the original principal, or even the interest on that and the court expenses, he sinks into a sea of anxiety worrying about his family prospects. Gradually his family sink into starvation and die of want.

But a man whose property has been stolen by a thief is anxious only for a time, then he braces himself, does whatever work he can and spends the rest of his life quite happily. Therefore it is a greater sin to deprive a man of his property by borrowing and not paying back than to steal all that he possesses.’

Translation from *Palapadam*.

மனைத்தக்க மானபுடைய ளாகித்தற்கொண்டான் வலித்தக்
காள் வாழ்க்கை துணை.

‘The woman who possesses all the virtues of a good housewife and who keeps her expenditures within her husband’s income, is a good partner in life.’

Kural.

‘Owe no man anything save to love one another.’

St. Paul.

இளமையில் முயற்சி முதுமையில் காக்கும்.

‘Industry in youth will support one in old age.’

Proverb.

CHAPTER I

DEBT

Mr. Ranganathan was growing increasingly unhappy. He ate very little, he got up frequently in the night and walked restlessly about, he did not listen to the tales his children or his wife told him, and he grew thinner and older in a few months' time. To his wife's questions he would say 'It's nothing', but she was worried about him. Once she guessed that he was worrying about debts.

'Is that what you are bothering about?' she asked. 'Why worry? Is the money-lender troubling you? Are you the only one who owes money? Our neighbours owe hundreds more than we do. Every one owes money. Don't worry!'

But this advice did not help Mr. Ranganathan. He had gone on borrowing money for years without thinking very much about it. His salary seemed a large sum when he brought it home the first of every month, sixty whole rupees. He was a generous man. He liked to give his wife sarees and jewels, and his daughters bangles. He liked to give his children money to spend, and take them to the cinema. When Padma was married he wanted to entertain all their relatives in a generous way, so he borrowed Rs. 300 from a money-lender, who was charging him 12 per cent interest. He had a bill at the cloth-merchant's for Rs. 150 on which he was paying 12 per cent and another bill at the goldsmith's for gold *kappus* which he had given Kamala and ear-rings for Sita, which amounted to Rs. 50 at 12 per cent interest. Now it seemed that all his salary went on debts. 'His creditors stretched out their hands to grab his

salary before he could get it home to buy food for his family. Before the month was over he had to borrow more. Interest on old debts was piling up until it exceeded the original principal. His children's school-fees and book-bills were increasing. Narayanan would soon be wanting to go to Madras to college. Kamala would soon have to be married. He felt sorry not to have paid his old friend, the doctor, for expenses incurred during Sundaresan's illness. Difficulties seemed to be closing in around him until he felt nearly mad. He felt like one of the patient oxen that plod round and round in an oil-mill, without getting anywhere. He could not seem to think of anything to do but to apply for positions with a larger salary, which he never got, or address petitions for an increase to his employer. He was a self-respecting man and he hated the state of being in debt. He walked home a long way around in order to avoid passing the shops of the goldsmith, cloth-merchant and rice-merchant. He could not borrow money jovially and easily any more, as many of his friends did.

His debts preyed upon his mind so much that one day, when his wife asked permission to get a new Karachi saree for Kamala, he snapped out a refusal in so angry a manner that she was frightened. It was so unlike him. She noticed that he was nearly in tears, and begged him to tell her what the trouble was. Although he had always kept money-matters to himself, he finally opened his mind to her and told her all his difficulties. He wrote down on a paper a list of his debts still unpaid, and the interest.

'It is not yet the 15th of the month,' he concluded, 'and I have only some silver left. Yes, of course the rice-merchant will give us credit, but that just adds to the interest.' In eight years the interest mounts up to the amount that we borrowed originally. We are piling up more and more.'

It is hard while all the children are young,' said his wife. 'Some day Narayanan and Sundaresan will be earning big salaries to help you pay off these debts.'

'Yes,' remarked her husband bitterly, 'and by that time I will die and leave them a legacy of debt such as my father left me. It spoiled my whole youth to pay off his debts. I won't leave my sons such an inheritance.'

His wife went away with a grave face and did a great deal of thinking in the next few days. Her husband was thinking too. He was a book-keeper, and it occurred to him that he should apply at home some of the principles that were applied in the office where he worked. He jotted down figures on paper, and finally asked his wife to give him a list of her expenditures for one month. He himself began on the first of the following month to write down every anna that he spent. He was amazed to find how the little sums mounted up—the coins he gave to Sita, the four-anna pieces and eight-anna pieces he gave the boys, supposedly for pencils and note-books, the coppers he tossed to beggars, the cinema-tickets, the flowers his wife bought everyday, stamps and post-cards for letters, and other trivial expenses. They seemed like nothing at the time, but they added up to ten rupees in a month. At last one holiday, when he was at home, he and his wife sat down together and faced the situation.

'This cannot go on any longer,' he said decidedly. 'We are getting more and more deeply into trouble. We are living like rich people when we are really poor people. Yes, we are! We never stop from buying anything we want. Now it has got to stop. I cannot look anyone in the face until we put things right.'

'Now that I think about it,' agreed his wife, 'I feel the same way. I used to go to the hospital so often to see the

doctor as a friend. Now that we owe her money I am ashamed to meet her. Not that she says anything—I just feel it. Debt ruins friendships. Moreover, the cloth-merchant and the rice-merchant are rude to me nowadays. I can't say anything when they are doing us a favour. I send the servant instead.'

They wrote down Rs. 60 in large letters at the top of a sheet of paper, and began to work out how much they could spend each week on food, on clothes and on sundries, and how much they could repay each month. It is too long a story to tell of all the suggestions and deliberations. At the mother's request the older children were called into the conclave and asked to help in solving the problem.

'After they understood the reason for the changes in diet, they co-operated and helped me. If they understand our difficulties they will be willing to give up their pleasures.'

The first conclusion they came to was that they could not possibly continue making the expenditures which they were in the habit of making. Roughly a month's expenditures were as follows :

		Rs	A	P	
Food	...	40	0	0	(often more)
House Rent	...	10	0	0	
Dhoby, sweeper, servant.		5	0	0	
Kerosene, etc.	...	2	0	0	
Boys' fees	...	7	0	0	
Kamala's fees	...	8	0	0	
Sundries	...	10	0	0	
		82	0	0	
Income	...	60	0	0	
Deficit	...	22	0	0	

Father, mother and children stared at these revealing figures in amazement and dismay.

'There's an English proverb: "Cut your coat according to the cloth",' said Mr. Ranganathan. 'We have been trying to make a man's coat with about half a yard of cloth!'

'I will get on without a servant,' said Mrs. Ranganathan.

'And I will stop going to boarding-school and help you,' said Kamala, bravely, trying not to cry. 'I have had Fourth Form and that is more than most girls have.'

'No, no!' said Narayanan, touched by this abnegation. 'I am a boy. I ought to go to work.'

'Wait a minute,' said their father. 'That may be false economy. We must first make up our minds which expenses are really vital, which we can go without, and which we can reduce. Education seems to me to be vital, because it is a paying investment. It will return us dividends, both in money and in more important matters. That must be the last thing to cut out. College may not be possible, but High School is a real necessity, and I am not going to favour the boys more than the girls in that!'

After some discussion they made a list of the more important things and the less important things for people in their position and with their income. This was their list:

NECESSITIES

Nourishing food.
Sanitary house.
High School education.
Enough clothing to be clean
and warm.
Saving for future.

LUXURIES

Rich and expensive food, as
sweetmeats, palagarams.
House on main street.
College education.
Silk sarees and jewels for
women.

NECESSITIES (*cont.*)

Religious and charitable duties.

Health necessities, as blankets, medicine when ill, etc.

Moderate hospitality.

LUXURIES (*cont.*)

European clothes for men.

Cigarettes, cinemas, frequent train-trips, presents to friends.

Furniture, as chairs, tables, etc.

Lavish hospitality, and extravagant expenditure at weddings and other ceremonies.

Each member of the family was silent as he or she thought of an accustomed expenditure in the 'Luxury' list which was especially hard to give up, but their feet were set in the new and untried path of Thrift, and there was no going back.

QUESTIONS AND ASSIGNMENTS

1. Which of the 'Luxuries' do you think were hardest for each separate member of the family to give up?
2. Would you transfer any item from one column to the other, or add anything that is left out?
3. Make a 'Necessities' and 'Luxuries' list for your family, considering your income.
4. Is debt ever justifiable? When?
5. Make a list of the evils of debt.
6. Debate the following questions in class :
 Is it wrong to borrow large sums of money for weddings?
 Is it wrong to entertain generously every guest that comes to the house, even though it involves debt?
 Is the current practice of giving money to countless beggars a good thing for India?
 If you had just five rupees with which to buy *either* a pair of ear-rings *or* a blanket for the rainy season, which would you buy?
7. Write a composition on the Tamil proverb : 'First build the wall and then carve or decorate it'.
8. Are thrift and economy equivalent to stinginess?
9. The girls of one school formed a No-Debt Society, whose mottoes were : 'Owe no man anything but love'; 'Neither a borrower nor a lender be'. They called the roll every week, and any member who could not answer : 'I have neither borrowed nor lent since the last meeting', was put on the Black List. What do you think of lending? Would you like to start such a society?

CHAPTER II

THRIFT AND ECONOMY

The Ranganathan family were not theorists. When their eyes were once opened to their duty, they lost no time in doing it. Mr. Ranganathan walked out to two or three villages on the outskirts of his town, and at last found a house for rent of Rs. 3 per month. It was a simple village-house with mud-walls, and thatched roof, but it had a yard enclosed by a mud-wall, and two rooms, and was surrounded by barren land which might later be cultivated as a garden. When the family walked out to see it, the last Sunday in June, it looked dirty and desolate, not at all a 'sanitary house'. Mrs. Ranganathan was not to be daunted.

'Wait till I get it cleaned up!' she declared. 'We'll change that old cow-shed into a kitchen, so that there will not be smoke in the rooms. What we need is a lot of palm-leaves and poles and bamboo-screens, and the help of a carpenter for two or three days. We'll screen off that corner for bathing, and let the water run out to the garden. Further away they can dig a shallow trench and put screens around for a latrine. When the trench is full we can cover up the trench and move the screens to a new place. By the time we are rich enough to buy that land,' she added, laughing, 'it will be already fertilized. Meanwhile we shall be clean and decent without the cost of a sweeper. We'll put a pandal in front to give the men a place to entertain their friends and to sleep at night when it's hot, than we shall have two whole rooms inside.'

'And we'll plant vines and flowers to hide those ugly

walls,' exclaimed Kamala catching her mother's enthusiasm. 'Oh, I wish I did not have to go away! Let's move quickly before I go!'

Within the next few days they actually carried out their plans and moved, greatly to the consternation of friends and relatives who tried to prevent it. Debt was a perfectly respectable condition to be in, but a mud house in a village—! Who ever heard of such a thing? What would this crazy family do next? Every one prophesied trouble. In spite of their secret qualms and apprehensions, and their sorrow at giving up the familiar home, the family moved, and none too soon, for the landlord raised the rent to their successors. Mr. Ranganathan and the boys had to get up early in the morning to work at clearing up the yard and starting the garden, before their two-mile walk to town, Sita, now in First Form, trudging sturdily along beside them. Mrs. Ranganathan got up still earlier to fetch water from the village well, cook the morning meal, and fill tiffin-carriers with a nourishing mid-day meal for them to take with them. When they left the town she had found another place for her servant, and was now doing all the work herself. To all Kamala's protestations that she would give up her schooling and help her, she only replied :

'No, I want you to have a good sensible education such as you are getting, so that your children will not have to suffer from their parent's mistakes as you have. If I had been properly trained, I should have managed my husband's income and my family's health from the beginning, instead of having to learn by sad experience. I am strong and well, and the baby is old enough to amuse himself, and it won't hurt me to work.'

Next to the father and mother, the boys suffered the most by the change, for they had to drop out of many school

organizations and activities, both for lack of time and lack of money. They did the necessary shopping in the bazaar for their mother, called for Sita at her school, and started on the long walk home by five o'clock, not waiting for their father. At first they were too tired to work in the garden, but in a month's time they had got used to the walk and did not feel it. A heavy rain softened the earth, and they went to work fencing in a piece of the barren land and digging it up. Two holidays coming opportunely in succession gave them a chance to finish the work and plant greens and various ordinary vegetables. Now it only needed watering and weeding everyday which did not take much time.

The night before Kamala left, two weeks later, for school, her father talked over his plans for her. 'I shall send you Rs. 8 the first of every month,' he stipulated. 'Out of this you pay your boarding fee and get a receipt. The remaining two rupees you may keep for incidentals, but I want you, for good training, to write down in this little account-book every pie that you spend. I am going to do the same with the boys. I want you to learn to be better managers than your parents! When you need extra money, send me an itemized statement, in a business-like way.'

Kamala not only promised to be strictly economical but took off her precious gold *kappus* and insisted upon returning them to her father, beseeching that he sell them back to the goldsmith. Inspired by her sister's example, Sita returned her ear-rings. The father at first refused to take them, but his wife insisted.

'Do not stop them in their efforts to help. Why should they wear jewels when we are trying so hard to get out of debt. I want you to sell some of mine too.'

'Never mind about buying me a fountain-pen,' said Sundaresan heroically, 'I'll get on with a pen and an ink-bottle.'

'I'm buying some of my text-books second-hand,' offered Narayanan, 'and we can save a lot on note-books if we're careful.'

'What helpful children we have !' exclaimed Mr. Ranganathan, much touched.

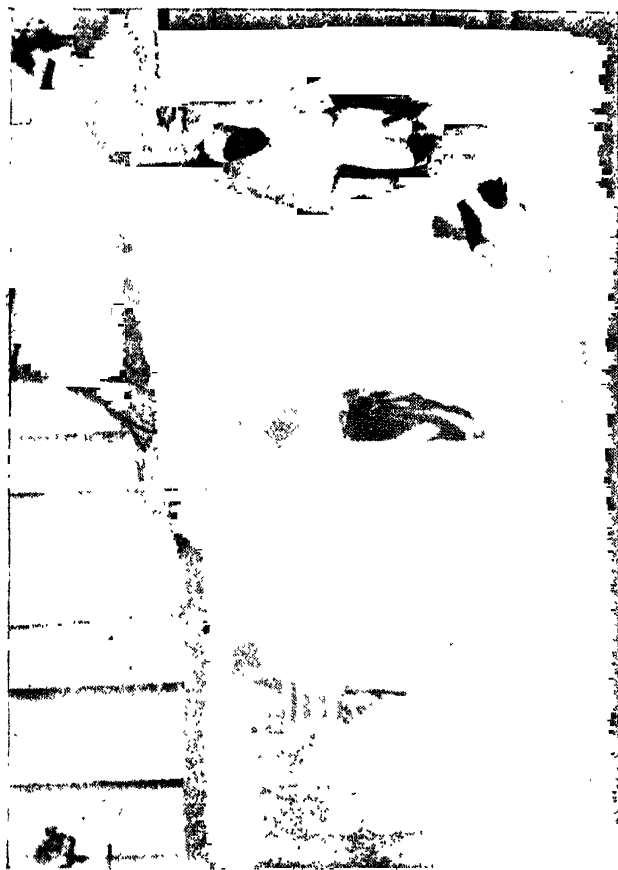
Mrs. Ranganathan found that her village neighbours, who were further from the bazaar, bought their staple supplies in large quantities at the harvest time and stored them up in great earthen pots one on top of the other, from floor to ceiling. She decided to do the same. She and her husband watched for the right seasons and laid in paddy, tamarinds, ragi, cholan, chillies *dal*, ground-nuts and various curry-stuffs. They needed money in hand to do this and so a further step was necessary.

Co-operative Credit Societies

Mr. Ranganathan had been looking up the matter of Co-operative Credit Societies. He found that by joining the Co-operative Credit Society in the village he could obtain a loan at a lower rate of interest—9 per cent—than any of his other creditors charged him. With money from the sale of some of the family jewels he bought a few five-rupee shares in the local Society and was registered as a member. The officers were a President, a Secretary and three members of the *panchayat*. This society was one of a union of societies in that taluk, and was under the supervision of a Co-operative inspector who came around to check the accounts. It was like being a member of a village banking company. The *panchayat* obtained a large loan from the local town bank, and distributed it in small loans among its members. Mr. Ranganathan obtained a loan large enough to cover all his debts to the money-lender, the cloth-merchant and the goldsmith. These were Rs. 500 in all. He borrowed an

additional Rs. 100 as capital, getting in all a loan from the society of Rs. 600, and promised to pay each month Rs. 4-8-0 for interest and Rs. 7 on the principal. He paid off his creditors with a great resolve never to borrow from them again. They were apt to raise the interest at any time, or to encourage his delaying the payment of the principal whereas the Co-operative Credit Society would hold him strictly to his agreement. He went to his old friend, the doctor, and offered to do either typing or book-keeping for her for an hour in the evening and on holidays, in order to pay off his debt to the hospital. This offer she gratefully accepted, and although the extra work was hard, he felt a sense of satisfaction at being able to fulfil his obligations.

After hearing the lecture on 'Supplementing the Family Income' which you will read in the following chapter, he and his wife decided to raise goats and poultry as well as vegetables, for Mrs. Ranganathan wanted to continue giving the children nourishing food. For Rs. 50 of the extra Rs. 100 which he borrowed as capital, they bought a good pair of goats, and for Rs. 10, a rooster and four hens of a good breed. With the remaining forty rupees they put up a shed for the goats, and a fowl house of bamboos, Mr. Ranganathan and the boys doing a good share of the work themselves on Saturdays. Mrs. Ranganathan paid a goatherd a few annas a month to graze the goats. The poultry were not hard to care for, but she kept them inside the yard unless someone could watch them, to avoid the vermin and diseases of the country fowls in the village. In a few months time they began to realize some gain on this investment, in the eggs and milk which they needed, and a year or two later they were making money by selling the surplus. They felt that the loan was justified, for they gained enough to pay it several times over in the end.



A FOWL HOUSE

These boys built this sanitary fowl house for less than ten rupees. It is protected by wire-netting.

But at the beginning it was hard work for the mother of the family. Since all the children went to school, she had to do most of the work in their absence,—pounding paddy and ragi, watching the poultry and the garden, carrying water from the village well, grinding curry-stuffs, keeping the house and yard clean, and cooking. She was the first one up in the morning and the last one to lie down at night, and she was on the go all day. She learned by sad experience, however, that there is an economy of strength and an economy of time, too, as well as of money. She learned to plan her work so that she got a little time to lie down and relax in the middle of the day, when the baby was asleep. In time she found that the outdoor exercise of carrying water and gardening was making her strong and well. Similarly her husband found that his long walk morning and evening did much to counteract the effects of his long day in the office. The family thrived in their home despite hardships.

Budgets

. In order to find out how much money they could spend for various purposes without overrunning, the family made out a rough estimate of their probable expenditures for a year. This plan of how to divide the expenditure under different heads is called a budget. The Ranganathans' budget was something as follows when they first drew it up.

Annual Budget

July 1st, 1929 to July 1st, 1930

		Rs	A	P	Rs	A	P
Annual Income	...				720	0	0
Food							
Paddy	...	80	0	0			
Tamarind	...	5	0	0			
Grains, pulses, curry-stuffs, etc.	...	25	0	0			
Fuel	...	12	0	0			
Gingelly-oil (12 visses)	...	12	0	0			
Coffee seeds (6 visses)	...	15	0	0			
Sugar (24 visses)	...	9	0	0			
Milk (½ measure a day)	...	42	0	0			
Curd (@ 2 as. a day)	...	45	0	0			
Vegetables (@ 2 as. a day)	...	45	0	0			
Total for Food	...				290	0	0
Clothing							
Sarees for Mother	...	25	0	0			
Dhotis for Father and boys	...	10	0	0			
1 piece twill for shirts	...	15	0	0			
Coats and turban for Father and							
coat for Narayanan	...	10	0	0			
Skirts and jackets for girls	...	10	0	0			
Davannies for Kamala	...	15	0	0			
Four yards mill-cloth for Rajan							
@ 4 as. per yard	...	2	0	0			
Miscellaneous	...	3	0	0			
Total for clothing	...				90	0	0
House Rent @ Rs. 3 per month	...				36	0	0
Repayment of Debt @ Rs. 11-8-0.	...				138	0	0
Education							
Narayanan @ Rs. 5-4-0	...	47	4	0			
Sundar @ Rs. 2-12-0	...	24	12	0			
Kamala @ Rs. 8	...	80	0	0			
Boys' Games, Medical and							
Stationery fees	...	4	8	0	156	8	0
Sundries	...				9	8	0
Grand Total	...				720	0	0

The sight of this budget had a sobering effect on the family. It was obviously impossible to pay book-bills, train-fare, postage, and all other 'Sundries' with less than ten rupees a *year*. The good thing about a budget is that it shows, in hard, cold figures exactly where one stands.

'How I wish I were an educated women,' lamented Mrs. Ranganathan, 'so that I could work and earn a salary!'

'You are earning a large sum for us every month,' replied her husband. 'By agreeing to live out here in spite of inconveniences, you save us Rs. 7 house rent and Rs. 3 or 5 for a servant. By pounding all the grain and growing the vegetables yourself, you will soon save us many more rupees, as well as removing the 'milk and curds' from the budget as soon as the goat begins to give milk. Do not talk of going out to earn. You save us the amount of a salary in the home.'

'We must cut down the food expenditure,' the mother insisted. 'Boys, we'll eat ragi till your books are paid for. I'll see whether I can learn to cook cholam and kambu too, for they are cheaper and more nourishing. If you'll dig up the rest of the garden, we'll plant more vegetables to cut down that forty-five rupees.'

'Leave out the coffee and that will save sugar too,' added her husband. 'We shall have "plain living and high thinking".'

They started upon a course of rigid economy. Mrs. Ranganathan planned the diet with great care, so that it might be satisfying though plain. She mended the family's clothes as soon as they tore, and did much of the washing herself, for the dhoby treated the clothes so roughly. She cooked only the amount of food that was actually needed for a meal, instead of so much extra that it had to be thrown or given away. It was hard not to spend money on

hospitality, but that seemed a luxury for the time being. All of the family had to learn to swallow their pride and say frankly, 'I cannot afford it', or 'We cannot do that this year', when urged by friends to some expenditure. Needless to say, they had to suffer a great deal of criticism, especially from friends and relatives who were too shiftless to economize and get out of debt, as the Tamil proverb says : உள்ளவன் பிள்ளை உப்போடு உண்ணும், இல்லாதவன் பிள்ளை சர்க்கரைப்போடு உண்ணும். 'The child of the wealthy takes salt with his food ; the child of the poor, sugar.'

Those who taunted them most with being ' stingy ' were the very ones who would themselves say : ' Though the debt may increase to another hundred, bake the cakes in ghee ', தூரூடு தூறு ஆகிறது நெய்யிலே சுட்டி பணிகாரம், to which Mrs. Ranganathan would retort : ' One fourth supply of conjee for the stomach is better than debt.' கடன் இல்லாத கஞ்சி சால்வையிறு.

PRACTICAL WORK

1. Keep an account of your pocket-money for a month, balancing it every evening.
2. Make a more detailed clothing-budget for the Ranganathans, including the number of yards, the kind of cloth, and the price per yard. under each heading.
3. Make a budget for an outfit for Sita when she went away to boarding school.
4. Make a monthly budget for a group of five teachers living together, each getting a salary of Rs. 35 per month. Include house-rent, food and incidental expenses, omitting clothing.

After Kamala had been at school for a month, she sent her father an account of her expenditure of the eight rupees which he had given her. The opposite pages in her little account-book, which she copied and sent home, were as follows :

INCOME					EXPENDITURES				
		RS	A	P			RS	A	P
July 1	Received from				July 2	Boarding Fee ...	6	0	0
	Father ...	8	0	0		" 2 Pencil ...	0	1	0
	In hand from					" 6 Rubber ...	0	2	0
	last month ...	0	3	6		" 6 Ink ...	0	4	6
						" 30 Dhoby ...	0	4	0
						Postage ...	0	2	0
						Whole month's charity...	0	2	6
						Total ...	7	0	0
						Paid advance on book-			
						bill ...	1	0	0
									0
						In hand ...	0	3	6
</									

She wrote her father that she would try to save as much as possible each month to pay on her book and stationery account, so that by the end of the first term it might be paid without his having to send more money. She added that she was taking good care of her clothes, as her mother had suggested, and after learning how to wash and iron them in Domestic Science class, she hoped to save the money spent for dhoby. She hoped also to get some work in the care of the Chemistry laboratory which would bring her a rupee or two a month on her fee account.

This letter brought great joy and pride to her parents, for the previous year Kamala had written to them constantly

the garden began to produce enough vegetables for their needs. The sweepings of the fowl house and goat shed proved to be very good fertilizers for garden and fruit-trees. In time the goat had a kid, and began a long period of giving milk. The poultry thrived under Mrs. Ranganathan's care and soon their house had to be enlarged. From the sale of young roosters and eggs, she was proud to be able to earn enough to pay Narayanan's examination fees at the end of the year. Month by month the debt grew less. Narayanan found a job for a year, since college was not to be thought of until that should be paid. His earnings were a welcome addition to the family budget, but they all determined to continue their economy until they owed no man anything. Sundaresan was so much interested in their village-life that he was talking of going to an agricultural school and becoming a modern farmer. Their home, which had seemed at first a place to be ashamed of, now became a source of great pride. The bare walls were a mass of blue morning-glories. Zinnias brightened the garden. The pandal in front was a gathering place for the men and boys of the neighbourhood at night, while many housewives stepped in to consult Mrs. Ranganathan about their problems, for they admired her efficient house-keeping, and marvelled at the helpful spirit of her children. No book nor lecture could have inspired them to pride in their home duties as did her daily example. Her thrift became proverbial among the husbands in the village who urged their wives to do likewise. So, what seemed a great sacrifice and adversity, turned out to be a blessing in disguise, both for the Ranganathans and for their neighbours.

CHAPTER III

SUPPLEMENTING THE FAMILY INCOME

One evening Mr. Ranganathan heard a lecture by an American agriculturist who has a Farm School in India. The suggestions made seemed so practicable a way of supplementing the family income as well as of making possible an improved diet at little expense that you may be interested to read the lecture and put into practice its suggestions.

USE OF MILK BY THE AVERAGE INDIAN FAMILY

Milk and its products, such as curds, buttermilk, ghee, and butter are such vital necessities in the human diet that we can truthfully say that the progress of civilization is in direct proportion to their extensive use. Especially should the use of milk and eggs be encouraged in India where the vegetarian diet is more suitable than the meat diet. • Milk and its products contain, in a very easily digestible form, almost all the food nutrients which a person needs. This is why it is so generally used for children, invalids and sick folk. Even the village people of India appreciate the value of milk for babies as is evidenced by the rather universal custom of relatives nursing each others' children, when other milk is not obtainable.

Tourists in a country like Japan are very much interested to see bottled milk being sold in all the principal railroad stations as coffee or tea is sold in India. We all realize that the economic status of the average Indian family is very low indeed, but if a nutritive food like milk could be

substituted rupee for rupee, for such expenditures as betel, coffee, sweets, tobacco, and toddy, a very radical change would soon take place in the improvement of the diet. The value of milk as a food should be advertised in India as is being done in other countries.

The sources of milk in India are buffaloes, cows, sheep, goats and donkeys. Unfortunately the people of India consider quantity rather than quality in the keeping of cattle of all kinds. The result is that there is not food enough for any of them with subsequent result that they produce very little milk. It would be very much better if the villagers would keep half as many cattle and give the fodder now consumed by the large number to the remaining animals. Every animal must first of all provide for its own body maintenance before it can produce a surplus for man. Therefore, it is the last 25 per cent of food given to an animal that produces a surplus and a profit. Milk-producing animals, whether they be buffaloes, cows or goats must be well fed especially with milk-producing feeds. In the ordinary course of events, these are the concentrated feeds such as bran and *poonac*. A milk-producing goat, buffalo or cow may be able to get enough bulky feed such as grass, straw, or fodder but it never can get enough of the concentrated feeds by grazing or foraging. These must be given or the animal cannot possibly produce more than a few ollocks of milk. If it were fed daily with a little bran or *poonac* the quantity of milk produced would be very much increased and the lactation period would also be considerably lengthened.

The goat has been called 'the poor man's cow', the reason being that a goat can live and flourish where other animals would perish. The goat is a great scavenger. In India, where leaf-producing trees are so plentiful and so

easily raised, every village family can easily have its pasture ground above their heads if they take the trouble to plant a few good trees in the waste places around the village and in their fields. A few good trees would be enough



‘ THE POOR MAN’S COW ’

Goats and a garden are profitable and easy means of supplementing both the family diet and the family income.

to provide the extra bulky feed which two or three good goats would need, in addition to the grass and other food they could scavenge. A good goat should produce at least a Madras measure of milk a day if well-bred and well-fed. This is a great deal more than the average Indian cow produces. Goat milk is the very best milk obtainable.

Goats are immune to tuberculosis whereas cows are not. Thousands of people all over the world die every year because they drink milk from tuberculous cows. Bovine tuberculosis is transmitted to man through milk and its products. Great campaigns are waged in America to eradicate all such cows. In India, where tuberculosis is such a widespread disease, this is a factor worth considering. Goat milk, if produced under sanitary conditions, is absolutely unobjectionable. Milk very readily and rapidly absorbs odours of all kinds. Male goats always have an objectionable odour which very largely accounts for the prejudice against goat milk. The milking process should always be done in clean vessels and in a clean place. Immediately take the milk into the house away from filth and objectionable odours. If these precautions are taken goat milk is very good indeed, and is to be recommended to the people of India who generally cannot afford to keep the more expensive cows. A good goat well kept, will provide plenty of milk for the average family. Its milk flow should continue for at least a year. People will object that a goat is a terrible nuisance because it is always up and into everything. So are children unless they are well trained and cared for. We never can expect anything for nothing. With a little initiative and determination I am persuaded that every Indian family could easily have the necessary milk, curds, buttermilk and ghee for its own use. Usually these products are sold in a most terribly filthy and adulterated condition. Produce your own and know that it is clean and safe ! The increased health and happiness that would result from the more extensive use of clean, sanitary milk, buttermilk, ghee and curds for the whole family, would pay big dividends for the additional care and food that should be given to a good buffalo, cow or goat.

POULTRY KEEPING IN INDIA

Perhaps many people in India will be surprised to learn that their native land is generally credited with being the native home of our present domesticated fowl. Last year a World's Poultry Congress was held at Ottawa, Canada. At that time a pen of the old type of jungle fowl had been imported and was one of the most interesting exhibits on display. As early as 1000 B.C. an Indian poet, inspired by the early cock-crow in the jungles, told his fellow countrymen that they should learn at least four lessons from the cock. These were, to rise early, to fight bravely,



WHITE LEGHORN FOWLS,

in a school poultry-yard, and a country hen who mothers the chicks. to protect their spouses in time of trouble and to eat with their families. What India may have learned from the rooster, I do not know, but when I consider what the people of America and Europe have taught the rooster and his family, I doubt very much whether the rooster has learned a great deal from the Indian people.

Often people say that poultry raising is only good as a pasttime for the women and children but not really worth while for a man to bother himself with. In answer to this let me say that last year in America poultry rated as one of the five major farm industries. The total income from the humble hen was over 38 crores of rupees or more than three times the amount of money that the Government of India is spending for educational purposes in this entire land. This cackling, singing, crowing creature has a message and a vital one to India that may mean a great deal in better living conditions.

Conditions for Poultry Keeping in India

India has many advantages for this venture over some of the other Western countries. Conditions here are very similar to those of China, which today is the second ranking country in the poultry industry. China exports more eggs than any other country in the world while not a single egg from India goes into the channels of International trade, let alone for home consumption use. The consumption of America is 250 eggs per individual and Canada exceeds this by 100 more. In other words Canada has realized her goal set several years, 'an egg a day for all'. In India it is always difficult to get good eggs and often poor eggs are hard to buy. In comparison of the numbers of eggs consumed *per capita* per year, I quote the following :

Norway	... 61 eggs.	Germany	... 117 eggs.
Denmark	... 75 „	France	... 133 „
Sweden	... 86 „	United States...	250 „
Great Britain	... 110 „	Belgium	... 213 „
„	Canada	... 367 eggs.	

In India the climate is such that a very small financial outlay is required for housing chickens. The climate is very

much more suitable to the hen than is the cold temperate weather. The people of India eat a great deal of rice which is a food extremely high in its starch or carbohydrate content. The egg is a food very high in its protein content and should be used a great deal more extensively to balance the rice diet. This is especially true for the younger children.

Comparatively a very small outlay is necessary to make a beginning in the poultry business. This should attract the poorer people and provide them with a means of livelihood as well as give them a more complete diet.

Poultry Breeding

The question is often asked, 'What breed of chickens is the best?' There is no best breed. We have today 127 recognized varieties of chickens and every one has some point in which it excels. The real problem is to decide what appeals most to the individual and to develop that variety to the highest possible degree. Some breeds are better for eggs while others are again better for meat. Each variety has been developed by some individual or group until it has become standardized. Such a fowl is pure bred and is the kind to keep because certain definite results may be expected. Many such fowls have been imported from other countries and have proved their adaptability to India.

With some pure breed as a foundation, I believe the greatest advancement can be made in India for the present by cross-breeding with the ordinary country chickens. Cross-breeds are more hardy and disease resistant, and this is quite an important factor until better sanitary methods are understood and used. The secret of cross-breeding is always to kill off or sell the male chicks and keep only the pullets which should always be bred to a pure bred male. An interesting experiment showed that while the ordinary

mongrel hen laid only 72 eggs, her daughters from a pure bred male laid 156 eggs. The second generation advanced to 188 eggs and the third generation to 192 eggs. It will be seen that the most striking advancement was made in the first generation. If the people of India would only observe this one point it would mean much for the betterment of poultry. Good male birds should be obtained from reliable breeders.



ANOTHER HOME INDUSTRY

For those who live near a tank, ducks may be profitable and amusing pets. Their eggs are large and nourishing.

The average hen in India probably does not lay more than 40 eggs a year. By careful breeding and selection fowls that lay 300 eggs a year, are being raised. The highest records reached by fowls are 354 eggs in 365 days from a hen, and 366 eggs in 365 days from an Indian

runner duck. This duck laid two eggs a day eight times and also skipped only seven days without laying. Only experts are able to get such results. An average of 150 to 200 eggs a year per hen is very satisfactory and entirely within the range of possibility for India.

Poultry Housing

It is a mistake to think that a maharajah's palace is necessary to house the improved variety of fowls. Probably the most satisfactory house the chicken ever had was a branch of some tree in the jungle. The best we can do is to imitate that condition. The house, whatever kind it be, should be light and open. Disease and vermin breed nowhere better than in dark, damp places. From this standpoint the ordinary fowl houses the villagers of India use are very poor indeed. Some of the walls should be removed and wire-netting or bamboo lattice work should be used to let in the sunlight and the air. Such an arrangement would still be sufficient protection against thieves and snakes, as well as weather. Any building that is dry, light, airy and clean is satisfactory. Preferably the building should face the east or north-east because of the sun and driving monsoon rains. About two square feet per bird is sufficient in India. Crowding beyond this is very bad and certain to lead to evil results.

A building of this kind should be cleaned out regularly and sprayed with boiling hot water about twice a month to kill the mites that might be breeding there. If about a half pint of kerosene and a little soap could be added to the boiling water, all the better. The perches, nest boxes and any corners especially should be well sprayed because it is in such places that the mites live during the day. They

attack the fowls at night while on the roosts and by sucking the blood often cause the fowls to become very weak and unable to resist the diseases that may attack them. These mites may also be infected with a disease and cause a healthy fowl to become sick after it has sucked the fowl's blood. The chicken mite, because it is the carrier of such a disease, is the most important insect to guard against. Apparently healthy fowls may sometimes be found dead on the roost in the morning due to the attack of the mites. Mites also may be so bad as to drive a poor hen from her nest of setting eggs in self-defence. As I mentioned before, the ideal place for mites to multiply is a dark, dirty, damp house. The best way to fight them is to make their living conditions impossible by letting in plenty of sunlight and air, and by keeping the place clean.

Poultry Feeding

If we visit a cotton mill in Madras or Madura, we naturally do not expect to see silk cloth manufactured from cotton lint. The manufactured article can only be of like quality with the raw material that has gone into it. The same thing is true of egg production. The hen really is a living factory where eggs are manufactured. Assuming that we have chosen a pen of fowls that has been bred for high egg production and that we have given them a house and yard that are suitable living quarters, the next important consideration is to feed them in such a way that the fowl can respond as Nature has endowed her.

If we want a chicken to put on fat, we must feed her fat-producing food. This means the starchy or carbohydrate foods such as are found in all grains and cereals. If we want a hen to lay eggs we must analyse the egg in order to know what we must feed. Doing so we find that

an egg is made up of 33 per cent yolk, 57 per cent white and 10 per cent shell. The yolk is chiefly fat while the white is albumen or one of the most concentrated forms of protein known. Such material is almost entirely lacking in grains as rice, ragi, cholam, etc., but is found more in groundnuts and gram and especially in all kinds of meat, fish and bones. It is because people do not feed hens enough of these latter foods that more eggs are not laid by the fowls. Unless all the materials are at hand for an egg with white as well as yolk, the hen will not lay it. This means that hens which feed only on rice and grains can lay only a few eggs because the white-forming material is not there. The yolks are produced, but are again absorbed into the body of the hen. All poultry-foods have been carefully analysed and I list a few to give you an idea of what they contain in 100 lb. of each food :

	Yolks	Whites
100 lb. rice	.. 254	125
„ „ ragi	.. 254	125
„ „ bran	.. 155	205
„ „ beef scraps	.. 106	1107.

It is always a good plan to feed a certain part of the food as a mash which is more easily digested than the whole grains. The following is a good ration for fowls that are kept penned up all the time :

GRAIN	MASH
20 lb. paddy.	20 lb. rice bran (good).
10 lb. horse gram.	20 lb. ground cholam, ragi, or kambu or mixture.
20 lb. cholam.	8 lb. of fish scrap, or meat in some form.
	2 lb. charcoal.
	4 ozs. of salt.

Each fowl will need about two ounces of food per day of which half should be whole grain and half the mash mixture. The mash may be fed either wet or dry. If fed wet it should not be too sloppy. A crumbly mash is best. The whole grain should be fed chiefly at night before going to roost though a small amount may be fed early in the morning. In addition to the above, each fowl should have at least two ounces of green food a day. Such a ration will cost about three annas per fowl per week. If the fowls are allowed to run at large, much less food of course can be given. However it never pays to economize on food for well-bred fowls. The fowls should be given all the well-balanced food they will consume. For the production of eggs, be sure to remember to give some meat food. Chopping up the bones that are bought for the curry is very good.

Feeding of Baby Chicks

The first ten days are the most critical period in a fowl's life. If a person can keep the baby chicks alive these ten days, chances are that he will be able to raise a good percentage of them. One of the most fundamental things to remember in this connection is that a baby chick should never be fed the first 60 hours after being hatched. The last thing that happens before a chick comes out of the shell is the absorption of the yolk into the abdomen of the chick. This serves as a supply of food during the first 60 hours. If additional food is given, a chick is overfed and serious indigestion results. Many may think that this is cruel, but let me say that in America today, millions of chicks are sent by post thousands of miles, often a three-day journey without any food and no bad results follow. It is nature's provision and we must not violate the rules of Mother Nature.

After the chick is 60 hours old, it should be fed at least five times a day giving only a very little at a time. The chick has a very small stomach and can use only a small amount at a time. But it should eat all that is given within ten minutes. After that the food should be taken away until the next feeding.

Poultry Diseases

Chickens represent a very small value *per capita* so it is seldom worth while to spend much time in doctoring sick chickens. It can be done for specially valuable birds but is not practicable for the ordinary fowl. A better practice is to prevent disease. Fortunately the chicken is very resistant to disease if kept under proper conditions. Spoiled and mouldy foods should never be fed to chickens as many people do so frequently. It is very dangerous and will never return a profit. As mentioned before, good housing is of the greatest importance in keeping poultry strong and healthy. The native fowl of India has developed a great resistance to the diseases peculiar to this country by many years of natural immunization. When the improved breeds are imported from America or Europe, they are more susceptible and therefore must be cared for in a better manner. It is for this reason that cross-breeding is recommended. By this system, some of the native fowls' resistance is retained. However, we know that even among the native fowls, thousands are carried away by disease every year. This is not surprising when we see the insanitary housing and feeding of the fowls.

Chicken-pox is one of the worst diseases we have to contend with. It attacks small chicks most seriously. Prevention rather than cure is recommended. The small chicks should be kept strong and active in order to resist the

disease when it comes. If an outbreak occurs, the sick chick should at once be isolated. The sores on the head may be painted with a very strong solution of iodine. Only soft and cooling feeds should be given. Plenty of green feed should be provided such as onion tops, etc. The well fowls should have their water supply disinfected with potassium permanganate at the rate of a small two-anna picce will hold per gallon of water. Epsom salts may be given as a purgative at the rate of $\frac{1}{2}$ teaspoonful per fowl. Occasionally sulphur given at the rate of $\frac{1}{10}$ th teaspoonful per bird is a good blood purifier and may be used especially in the hot weather.

Externally the fowls must be kept free from lice and mites. This is very important in consideration of the health of the flock.

There is no question but that India is well situated for the raising of poultry and that much can be done to make the using of eggs, especially, more popular. Few foods are more nourishing than are eggs. Because of their high protein content they should be used more extensively in balancing the heavy rice and starchy or carbohydrate foods. Eggs mean health to people of many countries. One of the first foods an invalid can eat is eggs because they are so easily digested. Eggs are a sanitary food; eggs are a nutritious food; eggs are an economical food. '*Sunshine in sealed packages.*' '*An egg a day keeps the doctor away.*' Both of these slogans may well be adopted in India.

PRACTICAL WORK

Start to raise a good breed of fowls at home or at school, following the directions given in this chapter.

CHAPTER IV

TWO LETTERS

Mrs. Ranganathan to Padma Narasimhan

My dearest daughter,

You will be happy to hear that Kamala has passed her Secondary Training course with high marks and is appointed as a teacher here in her old school, from June 15th. She can hardly wait for the day to come, for she is full of new ideas. With the help of her salary we could afford to move back to town, but none of us wants to do it. We love our home, and we feel that we should rather spend the money in making improvements here. Our Debt—that black shadow that has haunted us for four years—is now nearly paid. Both Kamala and Narayanan are determined to pay Rs. 30 a month from their salaries till it is wiped out, and then we can begin to breathe more freely and look toward the future. Sundar is still determined to be a farmer if he can get in at Coimbatore, and talks of our buying this land and building a better house.

Your *sittie* visited us last week for a day or two. She could not understand why we should have spent so much money to educate Kamala, instead of getting her married and off our hands. She fears that we may not find a husband for her now. I told her that I have changed my attitude about things since I grew older. Kamala's whole dowry is in her head and in her heart, not on her body in the form of jewels. If there is no bridegroom who prefers her sense and intelligence and loving nature to gold, then let her be as she is. She will never be helpless and

dependent, and a parasite like me. She can earn her living. But, of course, I should like to see her happily married. I used to feel that we were doing the children a great wrong to make them walk so far to school and work so hard in the garden and get on without money to spend even on harmless little pleasures, but I feel that it has proved to be a very valuable experience. They have twice the strength of character that their cousins have, who have never had to suffer or sacrifice. Do you remember that the doctor called Sundar a 'lazy jellyfish' once? He is a different boy now. God has blessed us with loving, helpful, unselfish children.

But you, Padma, learn a lesson from your foolish, ignorant mother. Don't borrow money. Don't spend lavishly and extravagantly as I did. 'Look after the annas and the rupees will look after themselves.' Lock up a few rupees every month for your children's future—for those hard days when they are all at school. Train your Leela and the boys to be thrifty from childhood. There can be no peace of mind and no self-respect for them so long as they are in debt. I hope you won't have to get on with so little as we have.

Your father is well. We are feeling very proud because he is now President of the Co-operative Credit Society here.

With my love to you all,

MOTHER.

Padma to Mrs. Ranganathan

My precious Mother,

Thank you for your letter. 'Think of little Kamala being a teacher and earning her living! What a new step for our family to take! I hope I shall have as much courage as you and Father have had, to do what is right and good in the face of tradition and criticism. Many great men give lectures here in our town about the evils of Child Marriage and Debt, and the need of education for women, but we observe that they stop their girls at home and marry them early and borrow for their weddings, just the same, while you and Father save very little, but quietly put your beliefs into practice. Kamala and Sita and I will thank you all our lives for our carefree girlhood and the chance to study.

Your words about Kamala's education remind me of some lines which I learned in Third Form :

'O lift your natures up! Embrace our aims -
Work out your freedom. Girls,
Knowledge is now no more a fountain sealed.
Drink deep until the habit of the slave,
The sins of Emptiness, gossip and spite and slander die.
Better not be at all, than not be noble.'¹

A friend of my husband's said to him the other day, 'I don't approve of these mills and machines and other labour-saving devices which lessen the work of the housewife. What will our women do with their time? They will only get into more quarrels through idleness.' When I heard it I thought of his wife—an empty-headed child with nothing to think about but her neighbours' doings.

I shall certainly remember your advice about thrift. My husband and I are determined to avoid debt. We are saving money, as you suggest, for our expenses are not so

¹ From Tennyson's *Princess*.

heavy while the children are young. But we do not lock it up! We put it in a bank in what they call a Recurring or Prudential Deposit where each rupee gains nine annas in two years. In this way our money earns more money for us, and at the same time we need not worry about thieves. We are already trying to teach Leela to save. Her father has a little tin bank for her, with a slit in the top, through which she likes to drop in *thumbuddies*. When they accumulate he puts them in the Postal Savings in her name. She has just one anna a week for spending-money. At first she spent it all the first day and begged for more, but she had to wait for a week until Monday came again. Now she has learned to show more forethought. When she is ten or twelve we are planning to put her on a monthly allowance big enough to pay for her fees, books and clothes, and let her pay out the money, and save up for clothes and buy them. I don't want her to think that money rains down from Heaven! We must be even more strict with the boys.

Do not worry about Kamala's marriage. There are plenty of men who want an educated wife, nowadays. Moreover, you must not try to give her such an expensive wedding-celebration as you gave me. People are realizing that a burden of debts is no sort of wedding-gift to give a young couple. I have been to two weddings lately that were finished in one day, at very modest expenditure.

Mother, you must not call yourself a 'foolish, ignorant parasite'! Some women are that but certainly not you. You are always wishing that you had had an education or a profession, without realizing that you are one of the wisest people in the world. You couldn't be wiser if you had a dozen degrees. And you have a profession—the best profession in the world, which is Home Making. You are

the centre around which we all turn—Father, the boys, Kamala, Sita, my husband, my children and I. Wherever you are is Home. If you are not there the house is just a house. You are always talking about how wonderful your children are. What they are, you have made them. I cannot tell you what an inspiration you are to me even now after I have left you, when I see you so rarely. I understand better than the others what you have done for us all, for I know what it means. You have poured out yourself for us. If each of your girls can be in her home one-half the Home Maker that you are, your influence will reach down through the generations. I know, too, how many homes you are influencing—your neighbours', yes, and even your disapproving relatives' homes, though they would not admit it. It is no credit to us daughters if we are good home-makers. We have had schooling and we have had you! But you did it all through your love for us. 'Where love reigns, the impossible becomes possible.'

With a heart full of love and gratitude,

Your loving child,

PADMA.

APPENDIX I

The Elementary Composition of the Body

(Table from *Chemistry of Food and Nutrition*, by Henry Sherman, published by Macmillan & Co., New York ;
2nd Edition, page 234)

Oxygen, about	...	...	65	%
Carbon, about	...	...	18	%
Hydrogen, about	...	...	10	%
Nitrogen, about	...	...	3	%
Calcium, about	...	...	2	%
Phosphorus, about	...	...	1	%
Potassium, about	...	...	0·35	%
Sulphur, about	...	...	0·25	%
Sodium, about	...	...	0·15	%
Chlorine, about	...	...	0·15	%
Magnesium, about	...	...	0·05	%
Iron, about	...	...	0·004	%
Iodine	}	...	{	Very minute quantities.
Fluorine				
Silico				

APPENDIX II

From an Outline sent out by the Mayo Clinic, Rochester, U.S.A.

Substance essential in an adequate diet	Some foods which may be considered sources of these essential substances	Some effects of the lack of these essential substances
Oxygen ...	Air ...	Failure of the nerves to function, fainting
Water ...	Water, milk, beverages, almost all foods.	Thirst, preventing func- tion of organs of body especially the nerves.
Proteins (amino acids).	Milk, meat, eggs, legumes, grains, etc.	Failure to grow ; loss of weight.
Carbohydrates...	Starches, sugars, syrups, grains, tubers, fruit, milk.	Lack of energy for work and growth.
Fats ...	Butter, lard, egg yolk, fat meats, vegetable oil, margarines, milk.	Lack of energy for work and growth.
Minerals ...	Milk, outer coat of grains, green leaves, meats, mineral mixtures.	Failure of bones to deve- lop, nervous disorders, digestive disturbances, goitre.
Vitamins ...	A. Butter, ghee, egg yolk, whole milk, green leaves, yellow corn, yellow tubers, liver, liver oils, kidney, mutton and other animal fats.	Sore eyes, nervous symp- toms, lowered resis- tance, colds and pneu- monia.
	B. Outer covering and germs of grains, nuts, yeast, tubers, milk, eggs, fruits, leaves, fresh meat, liver, tomatoes, celery, spinach, turnip tops.	Failure of certain nerves to function ; digestive disturbance.

Substance essential in an adequate diet	Some foods which may be considered sources of these essential substances	Some effects of the lack of these essential substances
Vitamins ...	<p data-bbox="335 339 615 465">C. Fresh fruits, fresh leaves, fresh tubers, milk, fresh raw cabbage, tomato juice and sprouted peas or dhals or gram.</p> <p data-bbox="335 488 615 753">D. Cod-liver oil, whole milk from cows receiving direct sunlight; eggs from hens receiving direct sunlight, substances irradiated with ultra-violet light. Ultra-violet light will cause the development of this vitamin in the animal body.</p> <p data-bbox="335 776 615 848">E. Grains especially wheat-germ, liver, leaves.</p>	<p data-bbox="630 339 713 368">Scurvy.</p> <p data-bbox="630 488 910 659">Rickets, failure to utilize calcium and phosphorus of the food resulting in disorders of nerves, bones, muscles; predisposition to tuberculosis especially of the bowels.</p> <p data-bbox="630 776 910 833">Failure to utilize iron, anæmia, sterility.</p>

APPENDIX III

Calories

The unit of heat is called a *caloric*. Energy is readily transformed into heat, as you can prove by rubbing the palms of your hands vigorously together. Heat is transformed into energy, as is illustrated in a steam-engine. The amount of energy expended in the body may be measured in terms of the heat produced. One calorie is the amount of heat required to raise one kilogram (2·2 pounds) of water one degree Centigrade, or one pound of water four degrees Fahrenheit. Expressed in terms of work it is that required to lift one pound through the distance of 3087 feet.

The body works during every minute that it lives, and the excess heat is given off through the lungs and the pores of the skin. Scientists have contrived to measure the amount of heat given off during various occupations, by placing a subject in an air-tight chamber called a *calorimeter*, where all conditions are carefully controlled, all heat given off is collected, and the amount of heat is determined. By means of the calorimeter, the amount of energy expended by the body of a man and of a woman, per pound of body weight, in the various occupations of normal life, and during rest and sleep, has been measured in terms of calories. If we know how many calories of energy we expend in a day, then we know how much fuel food we must eat everyday to make up for the loss.

In a healthy person on an ordinary mixed diet the fuel value of each foodstuff is on the average as follows :

Protein	...	...	4	calories per gramme.
Fat	...	...	9	" " " "
Carbohydrate	...	...	4	" " " "

From these figures are calculated the 'calories per ounce' in the appended tables of foods.

The energy-requirements of children and adults are given in the following tables. One may first determine one's own energy-requirement by considering the type of activity which predominates in one's day's programme. Studying or brain-work of any sort would come under 'Sitting at rest' as brain-work does not cause expenditure of heat. Divide the twenty-four hours of your day into so many hours of sleep, so many hours 'sitting', so many hours light exercise (walking, standing, dressing, etc.), so many hours active exercise (running, chopping wood, sweeping, carrying water, net-ball, etc.). With this and your body-weight you can estimate your energy-requirement per day. Then by means of the tables given you can weigh the food that you eat, and find out whether the number of calories it produces is enough for your energy-requirements. The tables for children make no difference between occupations, for children expend a great deal of energy in growing, regardless of how they employ their time. Children who are under-weight and under-nourished should be fed according to what their weight should be, not according to what it is.

TABLE I

(From Willard and Gillett's *Dietetics for High Schools*, p. 35)

Average Calorie Requirement per pound per hour for Adults

Sleeping ...	...	0.42 calories.
Sitting at rest ...	...	0.65 „
Light muscular exercise	...	1.10 „
Active muscular exercise	...	1.90 „
Severe muscular exercise	...	3.00 „

TABLE II

(From Rose's *Laboratory Manual*, p. 13)Average Total Energy Requirement of Children per pound
of Body Weight

Under 1 year	... 45	calories per pound.		
1-2 years	... 45-40	"	"	"
2-5 "	... 40-36	"	"	"
6-9 "	... 36-32	"	"	"
10-13 "	... 34-30	"	"	"
14-17 "	... 30-23	"	"	"

TABLE III

(From Rose's *Laboratory Manual*, p. 18)

Reduction in Energy-Requirement of Adults after Middle Age

For people from 60 to 70 years of age reduce 10 per cent.

For people from 70 to 80 years of age " 20 " "

For people over 80 years " 30 " "

SOURCE BOOKS

Rose's *Laboratory Manual of Dietetics*, New York,
Macmillan & Co., 1921.Willard and Gillett's *Dietetics for High Schools*, New York,
Macmillan & Co., 1922.

APPENDIX IV

The Process of Refining Sugar

(Taken, by permission of Parry & Co., from an account written by Mr. Farmer, formerly of their Sugar Refinery at Nellikuppam.)

The sugar crystals in jaggery are very small, but can be seen with the naked eye if closely examined. The impure jaggery is sold to the refiner who has to make it into white sugar, and by experience he finds that from 100 lb. palmyra juice he will obtain about 55 lb. white sugar and about 32 lb. molasses. The problem the sugar refiner has to solve is the removal of the brown colour from the jaggery and the production of colourless crystals, fairly large, hard and well-shaped which will have an attractive appearance and sell readily.

The refiner proceeds as follows: The jaggery, which is very crude and which contains many impurities, is first dissolved in hot water in large tanks, and lime is added, thus causing certain impurities to be precipitated, or thrown out of solution. This also neutralizes any acid present. This neutralization of acids is very important because acid has the property of converting cane-sugar (sucrose) into another totally different kind of sugar (invert sugar) which, although sweet and pleasant to taste will not form crystals, and if this conversion takes place the refiner will be left with a sweet syrup from which he cannot get white sugar. After the lime is added the crude sugar-solution is filtered through cloth bags and any mud, sand, fibre, leaves, etc. are retained by the bags while the sugar-solution passes through and comes out quite bright although it is still dark brown.

The next step is the most important of all. This is the removal of the colour so as to leave the sugar-solution bright and colourless like water and very pure. This great change

is accomplished by allowing the dark brown solution to trickle slowly through a large iron crystallizer 10 ft. \times 30 ft. packed full of charcoal. In its passage through the cisterns, the hot sugar solution is acted upon by the charcoal which absorbs the colouring matters and other impurities from the solution. Very little is known of the action of charcoal upon such solutions but it may be said to be more physical in its action than chemical and depends to a large extent on the porous nature of the charcoal. After the charcoal has removed a certain amount of colour from the sugar-solution the pores become clogged and it is unfit for further work until these impurities have been removed. This is accomplished by washing the charcoal with boiling water then burning it, out of contact with air, when it is again fit for use.

The colourless sugar-solution obtained from char cisterns is then boiled in vacuum pans from which the pressure has been exhausted by large pumps. The water in the solution is gradually boiled off (as steam) until there comes a point when the amount of water remaining is not sufficient to hold all the sugar in solution, i.e., the solution becomes super-saturated and very small crystals (nuclei) are suddenly formed. The boiling is continued and as more sugar is deposited it forms on these small crystals until they attain the size we are familiar with. The white crystals are then separated from the mixture of sugar and crystals by being spun in a centrifugal machine. This machine is simply a rapidly revolving basket of closely-woven wire. The centrifugal force at high speed throws the syrup off at a tangent while the white crystals are retained by the fine wire mesh. Previous to the invention of the centrifugal machine the draining of syrup from the crystals was a slow and tedious process.

All that is necessary now is to dry the crystals by gently heating them and to pack them in gunny-sacks.

Molasses : This syrup which has been separated is again boiled a second time to give more sugar which, however, is no longer white. After four or five such boilings it becomes very viscous and black and no more sugar can be boiled out of it. This syrup is called molasses and may still contain as much as 45 % sugar which is useless to the refiner as it will not crystallize, and is usually utilized by a distillery for fermentation to alcohol.

The refined sugar sold by reputable firms is an extremely pure product, probably the purest of all food products sold on the large scale, containing as it does 99.7 % to 99.9 % pure sugar (sucrose).

Cane : The greatest source of sugar in the world is sugar-cane, India being the only country where sugar is obtained from the palmyra tree. The sugar-cane in India reaches maturity in January and for the four months January, February, March and April.

The juice (75 %) is expressed from the cane by crushing between huge iron rollers usually three or four times. The remaining pulp known as trash or 'bagasse' is burned in the boilers as fuel. The process is almost exactly the same as that already described.

The soil of India is not particularly good for sugar-cane, the average crop here being about ten to fourteen tons per acre, while in Java under good conditions where the sugar industry has been scientifically developed, forty tons per acre is common. From ten tons of cane, one ton of white sugar is obtained. The total production of sugar in the world is about 23,000,000 tons per annum and it rises by half a million tons every year. Britain and America are the largest consumers of refined sugar, using about 80 pounds sugar per head per annum.

APPENDIX V

Diet for Diabetics

(Directions given to patients at Medical School Hospital, Vellore).

Treatment of Diabetes is by Diet. The patient must possess honesty, self-control and courage, and a desire to understand his treatment.

Foods arranged approximately according to content of Carbohydrates.

1 to 3 %	3 to 5 %	10 %	15 %	20 %
<i>Vegetable.</i>				Potato
Lettuce	Brinjals	Green beans		Shell bean
Cucumbers	Lady's fingers	Pumpkin		Corn
Spinach	Snake Kai	Turnip		Boiled rice
Greens	Radish	Squash		
Marrow	Cabbage	Beets		Boiled parupu
Celery	Pavakai	Carrots		(dal).
	Avaraikai	Onion		
	Peerkankai	Peas		
	Drumsticks	Nukhol		
	Leeks			
	Cauliflower			
	String beans (young)			
<i>Fruits.</i>				Mantans
		Lemons	Pears	Plums
		Limes	Apples	
		Pineapple	Grapes	
		Gooseberries		
		Oranges		
		Peaches		Nuts
		Mangoes	Nuts.	
		Strawberries		Almonds
		Melon	Walnuts	
		Water melon	Pecans	
		Musk melon		

Dietary

Fast until sugar free. Take desugarizing diet.

- 1st Day :* 7 a.m. 1 cup coffee with $\frac{1}{4}$ cup milk.
 1 egg.
 $\frac{1}{2}$ thin slice bread.
 12 Noon 1 cup boiled rice.
 $1\frac{1}{2}$ cup 5 % vegetable in curry or as *pugat*.
 $\frac{1}{2}$ cup curds.
 Night: $\frac{1}{2}$ cup boiled rice.
 $1\frac{1}{2}$ cup vegetables with meat curry.
- 2nd Day :* 7 a.m. 1 cup coffee with $\frac{1}{4}$ cup milk.
 1 egg.
 12 Noon $\frac{1}{2}$ cup dhall sauce.
 1 cup 5 % vegetables.
 $\frac{1}{2}$ cup curds.
 6-30 p.m. 1 cup 5 % vegetables.
 1 small serving meat.
- 3rd Day :* 7 a.m. 1 cup coffee with 2 teaspoonfuls milk.
 Noon $\frac{1}{2}$ cup vegetable soup.
 $\frac{1}{2}$ cup curds.
 6-30 p.m. $\frac{1}{2}$ cup vegetable soup.
 1 small serving meat.
- 4th Day :* Fasting Day. Drink water freely and 1 cup tea, and 1 cup coffee.
- 5th Day :* Fasting day if not sugar free.
 Clear meat broth may be added.
- 6th Day :* If sugar free add 1 cup 5 % vegetables.
 3 eggs.
 1 tablespoon butter, ghee, or oil (to season food).
- 7th to 12th Day :* Increase vegetables, fruit and meat, eggs, dhall and curds gradually each day

until patient is able to keep sugar free on the following diet.

Allowance for one day

2 eggs.
1 cup curds.
4 ozs. meat, fish or fowl.
3 cups 5 % vegetables.
2 chapathis or
1½ cup cooked rice.
½ cup cooked ragi or cracked wheat.
⅓ cup of ghee or oil.
½ cup milk for coffee or tea.
1 orange.

Substitutes

1 egg equals ½ cup curds.
½ cup 10 % vegetable for 1 cup 5 % vegetable.
1 orange equals 1 cup 10 % vegetable.
1 oz. nuts for ½ cup dhal (almonds).
1 plantain (medium size) for ½ cup cooked ragi.

Bran Cakes:

Learn to eat washed bran. It has little food value and is filling.

Recipe:

2 cups washed and dried bran.
2 tablespoonfuls ghee or oil.
1 cup sour milk or buttermilk.
3 eggs.
1 level teaspoon soda.
½ teaspoon salt.

Method:

1. Beat egg yolk.
2. Melt egg and add to egg yolk.
3. Mix soda and bran.

4. Add bran and soda mixture alternately with sour milk to the egg yolk and ghee.
5. Add salt to egg-whites.
6. Beat egg-white and fold into other materials.
7. Put into greased pan.
8. Bake in hot oven until done.

Divide into 12 servings :

1 piece will equal

Protein 2·8 grms.

Fat 3·7 grms.

Carbohydrates 1·0 grms.

Avoid :

Sugar.

Sweet cakes, palaharams.

Sweets.

Rice, bread, or any carbohydrate food.

Milk.

All foods in excess.

APPENDIX VI

Percentage of Calcium, Phosphorus and Iron in the Edible Portion of certain Foods¹

Food	Calcium (Ca)	Phosphorus (P)	Iron (Fe)
Bananas (Plantains) ...	·009	·031	·0006
Barley ...	·043	·400	·0041
Beans (fresh) ..	·056	·052	·00011
Bread, white ...	·027	·093	·0009
Bread, whole wheat ...	·05	·175	·0016
Butter ...	·015	·017	·0002
Buttermilk ...	·105	·097	·0002
Brinjals ...	·011	·034	·0005
Cabbage ...	·045	·029	·0011
Cauliflower ...	·056	·061	·0006
Cocoa ...	·112	·051	·0027
Cocoanut (fresh) ...	·024	·074	...
Cocoanut (dried) ...	·059	·155	...
Corn (Maize) ...	·027	·283	·00029
Cocoanut Milk ...	·02	·010	...
Cucumbers ...	·016	·033	·0002
Cholam ..	·020	·215	·0012
Carrot ...	·056	·046	·0006
Dates ...	·065	·056	·003
Dal ...	·084	·360	·0052
Egg-yolk ...	·137	·524	·0086
Egg-white ...	·015	·014	·0001
Egg (whole) ...	·067	·180	·003
Figs (dried) ...	·162	·116	·003
Flour (white) ..	·027	·092	·001
Flour (whole wheat) ...	·031	·238	·0025
Grapes ...	·019	·031	·0003
Greens ...	·106	·068	·003
Guava ...	·014	·03	...
Limes ...	·055	·036	...
Mango ...	·02	·017	...
Milk (skimmed) ...	·122	·096	·0002
" (buffalo's) ...	·203	·125	...
" (goat's) ...	·128	·103	...
" (sheep's) ...	·207	·123	...
Millet (Ragi) ...	·014	·327	...

¹ The figures on Indian grains were supplied by Dr. McCarrison ; the rest were taken from Sherman's *Chemistry of Food and Nutrition* Macmillan's, New York.

Food	Calcium (Ca)	Phosphorus (P)	Iron (Fe)
Molasses ...	·211	·044	·007
Mustard ...	·492	·755	...
Okra (Lady's-finger) ...	·071	·019	...
Onions ...	·034	·045	·0006
Oranges ...	·045	·021	·0002
Peas (dried) ...	·084	·400	·0057
„ (fresh) ...	·028	·127	·0017
Peanuts (Ground-nuts) ...	·071	·399	·002
Pine-apple ...	·018	·028	·0005
Pomegranate ...	·011	·105	·0004
Potato ...	·014	·058	·0013
Pumpkin ...	·023	·059	·0008
Radishes ...	·021	·029	·0006
Rice (brown) ...	?	·207	·002
„ (polished) ...	·009	·096	·0009
Spinach greens ..	·067	·068	·003
Tamarind ...	·007	·072	...
Tomatoes ...	·011	·026	·0004
Turnips ...	·064	·046	·0005
Whole wheat ..	·045	·423	·005

APPENDIX VII

Percentage of Proteins, Fats and Carbohydrates, Vitamin—Content and Calorie Value of Common Foods

With the kind permission of Dr. McCarrison and his publishers, adapted from the tables in the appendix of 'Food', by Mathematics pupils in Sherman High School.

FOOD-STUFFS	Per cent		Per cent of Carbohydrates	Calories per ounce	VITAMINS			
	of Protein	of Fats			A	B	C	D
Milk and Milk Products								
Cow's Milk	3.32	3.60	4.80	18	+	+	+	+
Human Milk	1.48	5.30	2.65	18	+	+	+	...
Cream	2.47	18.51	4.48	55	+	+	..	+
Cheese	25.97	31.37	1.76	111	+	Very little	...	...
Buttermilk	3.0	0.49	4.80	10	+	+	+	...
Skimmed Milk	3.39	0.28	5.08	10	+	+	+	...
Dadhi	4.94	3.53	2.82	18	+	+	+	...
Sheep's Milk	5.30	7.05	4.98	30	+	+	+	+
Goat's Milk	4.27	3.99	4.27	20	+	+	+	+
Buffalo's Milk	4.77	7.70	4.38	30	+	+	+	+

APPENDIX VII—(cont.)

FOOD-STUFFS	Per cent of Protein	Per cent of Fats	Per cent of Carbohy- drates	Calories per ounce	VITAMINS			
					A	B	C	D
Flesh Meat and Eggs								
Lean Beef	21.90	7.27	.....	43	V.L.	+	V.L.	+
Lean Mutton	21.09	6.99	.....	42	V.L.	+	V.L.	+
Goat's Meat	25.44	2.65	.....	36	O	+	V.L.	O
Pork	21.37	11.09	.....	53	O	+	O	..
Bacon	17.66	53.0	.....	155	O	..	..	+
Liver	2.687	6.0	2.68	43	+	+	+	..
Kidney	16.04	4.80	0.212	31	..	+	..	..
Brain	10.24	9.78	.....	37	..	..	..	..
Tongue	15.58	19.18	.....	67	O	..	..	..
Fat fish	18.79	13.07	.....	55	+	+	..	..
Non-fat fish	18.19	0.70	.....	22	..	+	..	..
Fresh-water fish	19.43	4.08	.....	32	..	+	..	..
Chicken	23.81	1.34	.....	30	..	+	..	..
Duck	20.49	10.38	.....	50	+	+	..	..
Pigeon	22.08	6.57	.....	42	+	+	..	..
Eggs	13.39	10.49	.....	42	+	+	..	+
Animal Fats								
Beef fat, mutton fat	1.2	93.28	.....	239	+	..	..	..
Lard	..	94.69	.....	241	O to V.L.	..	..	..

APPENDIX VII—(cont.)

FOOD-STUFFS	Per cent of Protein	Per cent of Fats	Per cent of Carbo- hydrates	Calores per ounce	Vitamins			
					A	B	C	D
Cereal Grains and Bread								
Wheat (atta)	13.78	1.9	71.90	102	+	+	O	.....
White Flour	11.09	1.30	76.11	102	O	V. L.	O	.....
Unpolished Rice	8.12	.3	78.79	99	V. L.	+	O	.....
Washed Rice	5.72	.53	93.07	113	O	O	O	.....
Polished Rice	6.32	.45	92.19	113	O	V. L.	O	.....
Parboiled Rice	6.5	.77	92.26	114	O	+	O	.....
Ragi or Bajri	9.82	1.62	82.5	109	+ to +	+	O	.....
Cambu	12.86	4.87	68.55	105	+	+	O	.....
Cholam	10.24	4.13	69.61	101	+	+	O	.....
Barley	10.49	2.19	72.79	100	+	+	O	.....
Oatmeal	11.90	8.58	70.00	115	+	+	O	.....
Maize (yellow)	7.52	1.69	73.49	96	+	+	O	.....
White Bread	7.06	1.16	52.29	70	+	+	O	.....
Suji or Semolina	14.81	2.4	50.17	80	+	+	O	.....
Rice Polishings	.....	.....	.....	...	+	+	O	.....
Dhals, Peas and Beans								
Fresh broad beans	9.39	.38	22.79	37	+	+	+	.....
Fresh French beans	1.90	.10	4.80	8	+	+	+	.....
Peas (dried)	6.53	.60	16.78	28	+	+	O	.....
Dhals	22.96	3.49	57.24	100	+	+	O	.....
Grams	20.14	4.59	54.06	96	+	+	O	.....
Soya Beans	33.92	16.60	33.56	119	+	+	O	.....

Nuts and Seeds

Almonds	18.58	56.39	15.19	182	V.L.	+	+	.....
Cocoonut	5.68	50.56	27.91	167	V.L.	+	+	.....
Ground-nut	25.79	38.58	24.38	155	V.L.	+	+	.....
Walnut	13.60	70.38	13.99	211	V.L.	+	+	.....
Other nuts	17.66	58.30	12.72	183	V.L.	+	+	.....
Linseed	22.61	33.56	26.85	142	to +	+	+	.....

Tuber and Root Vegetables

Potato	2.47	.14	28.79	36	V.L.	+	+	.....
Beetroot	1.20	.106	6.18	9	V.L.	+	+	.....
Celery	.60	.106	6.18	5	.....	+	+	.....
Onions	1.30	.106	10.81	14	V.L.	+	+	.....
Garlic	6.78	.106	27.91	40	+	+	+	.....
Carrots	.88	.106	7.98	10	+	+	+	.....
Leeks	2.50	.106	9.29	14	+	+	+	.....
Parsnips	1.69	.49	21.39	27	V.L.	+	+	.....
Radish	.98	.106	31.9	5	V.L.	+	+	.....
Turnips	1.20	.106	4.41	7	V.L.	+	+	.....
Yams	1.80	.21	22.23	28	.....	+	+	.....
Fleshy roots	1.76	.21	22.26	28	.....	+	+	.....

Green Leafy Vegetables

Brussels sprouts	3.25	.21	5.68	21	+	+	+	.....
Cabbage	1.37	.106	4.49	7	+	+	+	.....
Lettuce	1.9	.21	1.90	4	+	+	+	.....

APPENDIX VII—(cont.)

FOOD-STUFFS	Per cent of Protein	Per cent of Fats	Per cent of Carbo- hydrates	Calories per ounce	VITAMINS			
					A	B	C	D
Green Leafy Vegetables (cont.)								
Spinach greens	1.80	.21	2.89	6	+	+	+	.....
Turnip tops	4.20	.60	6.28	13	+	+	+	.....
Other Vegetables								
Tomatoes	.70	.106	4.48	6	+	+	+	.....
Rhubarb	.60	.07	3.63	5	.....	.....	+	.....
Cucumber	.60	.07	2.01	3	.....	.....	+	.....
Pumpkins	.98	.106	5.19	7	.....	+	+	.....
Brinjal	1.20	.31	5.08	8	.....	+	+	.....
Cauliflower	1.90	.21	5.90	9	.....	+	+	.....
Dhanroo (Lady's-finger)	2.01	1.11	6.00	12	.....	+	+	.....
Nolkole	.91	.56	11.66	16	V L.	+	+	.....
Artichoke	2.75	.21	17.67	24	.....	+	+	.....
Asparagus	2.40	3.53	2.33	14	.....	+	+	.....
Potal	.74	.....	1.30	2	.....	+	+	.....
Fresh Berries and Fruits								
Apples	.31	.21	12.50	15	.....	+	+	.....
Bananas or plantains	1.59	.106	7.98	11	V L.	+	V L	.....
Grapes	.60	.106	13.88	17	.....	+	+	.....

Lemons	..	.497	.40	3.10	5	.....	+	.....	.....
Oranges	..	.88	106	9.50	12	+	+	.....	.....
Pears	..	.31	.106	8.09	10	.....	+	.....	.....
Pomegranates	..	.63	.....	.67	2	.....	+	.....	.....
Peaches	..	.67	.106	9.39	12	.....	+	.....	.....
Pine-apples	..	.38	.31	9.71	12	.....	+	.....	.....
Watermelons	..	.38	21	6.71	9	.....	+	.....	.....
Papaya	..	.57	.....	.35	1	.....	+	.....	.....
Lichee	..	2.96	.24	6.71	12	.....	+	.....	.....
Mangoes	..	.14	.77	18.37	23	.....	+	.....	.....
Guavas	..	1.30	.70	8.02	12	.....	+	.....	.....
Dried Fruits									
Apricots	..	5.51	.31	49.61	63	.....	.....	.....	.....
Currants	..	1.097	.31	42.01	50	.....	O	.....	.....
Dates	..	1.59	.106	69.71	81	.....	+	.....	.....
Figs	..	1.98	.49	56.50	67	.....	+	.....	.....
Prunes	..	3.00	.31	40.38	50	.....	+	.....	.....
Raisins	..	2.19	.31	61.20	73	.....	+	.....	.....
Tamarind	..	1.37	.....	31.41	37	.....	+	.....	.....
Miscellaneous									
Jams	..	.21	.....	70.00	79	O	O	.....	.....
Marmalade	..	.21	.....	68.58	78	O	O	.....	.....
Wreacle	..	.21	.....	59.89	78	O	O	.....	.....
Condensed Milk	..	.879	8.30	54.09	68	O	O	.....	.....
Pickles	..	1.09	.38	3.99	7	+	+	.....	.....
Pepper	..	15.51	8.51	63	111	.....	.....	.....	.....
infant foods (tinned)	..	12.68	3.28	76.18	109	.....	.....	.....	.....
Sandesh	..	19.08	20.10	42.40	124	.....	O	.....	.....

APPENDIX VII—(con)

FOOD-STUFFS	Per cent of Protein	Per cent of Fats	Per cent of Carbohy- drates	Calories per ounce	VITAMINS			
					A	B	C	D
Miscellaneous—(cont.)								
Tea	O	O	O	.....
Coffee	O	O	O	.....
Cocoa (from Rose's Manual)	...	21.6	37.7	141	Not known			

Explanation :

Three crosses (+ + +) mean 'rich in'.

Two crosses (+ +) mean 'moderately rich in'.

One cross (+) means 'some' or 'poor in'.

O means 'none'. V.L. means 'very little'.

A blank space in the column under vitamins means that the vitamin-content has not been estimated.

Calories are given in round numbers.

One ounce equals 28.3 grammes.

APPENDIX VIII

Table showing Approximate Percentage of Water in Certain Foods

(Figures from McNally's *Sanitary Handbook for India*, pp. 207-213, and from a list supplied by the Government Agricultural Chemist, Coimbatore.)

Food	Per cent	Food	Per cent
Almonds	4·8	Gram (Bengal)	11·5
Artichokes	79·5	Gram (Mung)	10·1
Asparagus	94·0	Greens (spinach)	92·3
Beans (Haricot)	11·7	Ground-nuts	7·5
Beans (Soy)	11·0	Kambu	11·3
Beets	87·5	Meat (lean)	72·
Bread (from <i>Rose's</i> <i>Manual</i>)	35·	Milk	87·
Butter	12·5	Onions (fresh)	87·6
Cabbage	91·5	Peas (fresh)	74·6
Carrots	88·2	Peas (dried)	9·5
Cauliflower	92·3	Plantains	75·3
Celery	94·5	Potatoes	78·3
Cheese	35·6	Ragi	13·2
Cholam	12·5	Rice	12·8
Cocoanut pulp	14·1	Sugarcane	31·8
Dal	11·8	Tomatoes	94·3
Eggs	74·	Thenai	10·2
Fish	78·	Varagu	12·0
		Wheat	12·5

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